

## **Appendix E**

### **Background Information for Proposed Action and Alternatives**

1. Information Report. Supplemental Environmental Impact Statement Live-Fire Training Range Complex on Guam (February 9, 2012) ..... E-1
2. Technical Report. Guam Live-Fire Training Range Alternatives in Consideration of Probabilistic Methodology Modeling (March 2012)..... E-13

## **INFORMATION REPORT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT LIVE-FIRE TRAINING RANGE COMPLEX ON GUAM**

### **Purpose**

The purpose of this Information Report (IR) is to discuss the Department of Navy's (Navy) decision to prepare a Supplemental Environmental Impact Statement (SEIS) for the proposed construction and operation of a live-fire training range complex on Guam. This report provides information to assist the public during the SEIS scoping process.

*The Final Environmental Impact Statement for the Guam and CNMI Military Relocation, Relocating Marines from Okinawa, Visiting Aircraft Carrier Berthing and Army Air And Missile Defense Task Force* was published in July 2010 and the subsequent Record of Decision (ROD) was issued in September 2010. The Navy is proposing to reexamine alternative locations for a live-fire training range complex on Guam in an SEIS prior to making a decision on the location of the training range complex.

### **What is an Environmental Impact Statement and why is an SEIS being prepared?**

NEPA established the requirement for federal agencies to consider and compare the impacts to the natural and human environment from their proposed actions, as well as reasonable alternatives to their actions. If the federal agency determines that the proposed action may have a significant impact on the environment, it must prepare an Environmental Impact Statement (EIS). An EIS must describe the environmental consequences of implementing the proposed action as well as assess a reasonable range of alternatives to the proposed action. NEPA does not require that an agency choose the most environmentally-friendly alternative, but it does require that an agency take a "hard look" at the environmental impacts of its actions and disclose information about these impacts to the public. NEPA also does not require that an agency consider every possible alternative but that it considers a reasonable range of alternatives. What constitutes a reasonable range of alternatives depends on the nature of the proposal and the facts associated with each action. NEPA also promotes public involvement in the EIS process and provides for multiple opportunities for comment. Scoping, comment periods and meetings/hearings provide the opportunity for the public and resource agencies to provide opinions, concerns and input for consideration by the federal decision-maker prior to making a final decision on the proposed action.

The Final EIS for the Guam and CNMI military relocation was released to the public in July 2010. In September 2010, the Assistant Secretary of the Navy (Energy, Installations & Environment) signed a ROD that included selection of the locations for the Marine Corps main cantonment, family housing, and aviation and waterfront operations on Guam, and training ranges on Tinian. A decision on the location of the live-fire training range complex on Guam was deferred.

Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations (CFR) 1500-1508, July 1986) section 1502.9 (c) states that the lead agency shall prepare supplements to either draft or final EISs if:

1. the agency makes substantial changes in the proposed action that are relevant to environmental concerns, or
2. there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts.

Section 1502.9(c) also states that agencies may prepare supplemental analysis “when the agency determines that the purpose of the Act will be furthered by doing so.” The Navy is preparing an SEIS for the limited purpose of supplementing the 2010 Final EIS regarding the establishment of a live-fire training range complex on Guam.

A significant number of public comments were received during the EIS process regarding the Navy’s preferred alternative for the live-fire training range complex. The preferred alternative identified in the Final EIS was located entirely on non-DOD property along Route 15 in northeastern Guam. Two primary concerns were raised over this location: (1) the use of non-DOD property, and; (2) access to Pāgat Village and Pāgat Cave cultural sites. Though not directly impacted by range operations, as described in the Final EIS, access to Pāgat Cave and Pāgat Village would have been restricted when the ranges were in use because the sites fell within Surface Danger Zones (SDZs) that would have been established around the ranges.

In response to public comments and concerns raised by the Government of Guam, Guam Legislature, and other interested parties regarding the establishment of SDZs over Pāgat Village and Cave, in January 2011 the Under Secretary of the Navy committed to “four pillars” regarding the execution of the Guam military realignment.<sup>1</sup> The pillar most relevant to the proposed training range complex is the commitment that any range location proposed for the Route 15 area will ensure the public 24/7 access to Pāgat Village, Pāgat Cave and the existing trail to these sites as it is today.

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<sup>1</sup> As stated in a February 7, 2011 letter from Under Secretary Work to Governor Calvo, the four pillars are: (1) One Guam; (2) Green Guam; (3) 24/7 Access to Pagat Village and cave and (4) “Net Negative”

This commitment to 24/7 access to Pāgat Village, Pāgat Cave and the trail is reinforced in the Programmatic Agreement (PA) signed by the Navy, Marine Corps, Guam and CNMI SHPOs, and the Advisory Council on Historic Preservation on March 9, 2011. Section 5.C.3 (Page 16) of the PA states that:

“If DOD [Department of Defense] selects an alternative for the range complex in the Route 15 area as noted in the Final EIS, DOD commits to providing 24 hours a day/seven days a week unimpeded access to the Pāgat Village and Cave historical sites, as part of the measures to avoid, minimize and mitigate impacts on historic properties. DOD will adjust proposed range layout plans to continue unfettered access to these important historical and cultural locations. Pāgat Cave, Pāgat Village, and the existing path to these sites would not be included in the footprint of the complex or the surface danger zone for the ranges, and full ownership of these properties would remain with the Government of Guam.”

Following the signing of the PA, the Navy began evaluating options to satisfy the commitment for continued access to Pāgat Village and Pāgat Cave, while also meeting training requirements of the relocating Marines. By applying a probabilistic methodology that takes into account local geographic conditions and firing practices to more precisely identify land required for the SDZs, the Navy identified an SDZ for Route 15 Alternative A with a smaller footprint than was previously depicted in the Final EIS.<sup>2</sup>

While the application of the probabilistic methodology to Alternative A allows the Navy to implement its preferred range without impacting Pāgat Village, Pāgat Cave, and the existing trail leading to these sites, the use of this technique to establish the SDZ for the Route 15 firing range prompted the Navy to investigate whether previously excluded locations could now potentially accommodate the proposed range complex. As a result of this effort, the Navy identified one previously discarded site, the Naval Magazine (NAVMAG), also known as the Naval Munitions Site, that could be a potentially reasonable alternative. The probabilistic methodology was applied at NAVMAG and confirmed that this location could be a reasonable alternative for the training range complex.

In light of this information, the Navy has decided to develop an SEIS to consider range complex alternatives at or immediately adjacent to NAVMAG and in the Route 15 area prior to making a decision on the location of the live-fire training range complex. Although not required under NEPA, the Navy will publically scope this effort to determine whether any additional information or sites should be evaluated as part of the SEIS. Completing an SEIS will provide

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<sup>2</sup> Probabilistic modeling is sometimes referred to as “site-specific” modeling because SDZs are based on modeling that takes into account all aspects of the terrain, characteristics of the weapons being employed, specific firing positions, design of range safety features, and weather variables.



for more informed decision-making by the Navy when considered in conjunction with the analysis in the Final EIS. The public will have multiple opportunities to participate in this process by providing comments and identifying concerns that will help define the scope of the SEIS analysis and will be considered before the final selection of the location for the training range complex.

### **Marine Corps Training Requirements on Guam**

Marine Corps training requirements are dictated by current training and readiness (T&R) manuals and instructions, which outline the minimum proficiency level required of Marine Corps personnel based upon either their occupational specialty or, in the case of common skills, their rank and grade. The T&Rs further define specific training requirements for each type of Marine Corps unit and the weapons systems employed by that unit.

The Marines relocating to Guam will require individual weapons training on Guam. Ranges will be needed to support live-fire training for weapons such as the M-9 pistol, M-16 rifle, MK-19 grenade launcher, M-240G and the M-2 .50 caliber machine guns. It is essential for combat readiness that these ranges be located on island so training can be done consistently and efficiently. Six live-fire training ranges are required to support the individual skills training needs of the relocating Marines: (1) known distance (KD) rifle range; (2) KD pistol range; (3) non-standard small arms range; (4) modified record of fire range (MRFR); (5) multi-purpose machine Gun (MPMG) range and (6) a hand grenade range. Roadways and other supporting infrastructure would also have to be constructed to support the ranges.

### **Training Range Features**

All ranges have some common characteristics to include firing lines, targets, impact areas for the safe absorption of expended munitions, lateral limit markers (visual markers to ensure all Marines understand the direction of fire), range use indicators (red flag), and surface danger zones. Specific characteristics are dependent on the type of weapon system being used and the terrain on which the range is being built. Some specific characteristics can include catchment and mitigation berms and baffles (to contain errant rounds and to reduce noise outside of the firing range). Figure 1 below shows a notional training range layout.



*Figure 1- Typical Range Features*

Each individual range also has general features based on the planned use, weapons and munitions type. Space requirements are calculated based on the highest caliber weapon that will be used on a particular range. For instance, the land area required for a MPMG range is the largest of all the ranges because the .50 caliber heavy machine gun will be used on the MPMG range. The .50 caliber machine gun is among the most critical weapons for Marine Corps combat readiness given recent experiences in Iraq and Afghanistan. This weapon requires the largest range area (approximately 1,000 meters by 400 meters) and the largest surface danger zone (6,500 meters). Because the MPMG range has the largest space requirement of the ranges in the proposed complex, and because a large percentage of the surface danger zones for the other ranges—based on range orientations—fall within the surface danger zone for the MPMG range, siting the MPMG range becomes the critical consideration in identifying range complex alternative locations on Guam.

Safety is a top priority in the operation of any range. All ranges are controlled by a central Range Control office. Range Control ensures all personnel responsible for conducting training on ranges are qualified and certified. Range Control monitors the range environment and maintains communication with all occupied ranges. If communication is lost with Range Control, the range must cease fire to ensure safety. Range Control authorizes active fire on targets only after verification that no one is in the impact area, road guards are posted, and all gates are locked. There are extensive checklists that must be completed before, during and after live fire activities.

Additional safety characteristics include observation towers, telephones for emergencies, Position Safety officers, Range Safety Officers and an Officer in Charge. Roads leading into the impact area are blocked by locked gates, and at least two Marines are assigned to ensure that no one inadvertently enters a potentially dangerous area during live fire (including airspace). Safeguards are also provided to prevent access to SDZs during training.

### **Surface Danger Zones (SDZs)**

Because safety is paramount, while the footprint of the range impact area is relatively small and contains the vast majority of rounds fired, large SDZs are placed around each range as a safety buffer. An SDZ is defined as the ground and airspace associated with a training complex that contains projectiles, fragments, debris, and components resulting from the firing of weapons systems. SDZs are sized to ensure there is only a one-in-a-million probability of a round (or fragment of a round) escaping the SDZ boundary. Regulations include safety procedures to ensure that the SDZs are clear from all personnel and that the public is notified via NOTAMs (Notice to Airmen and Mariners), newspaper notices and radio, among other means, when training is conducted.

An SDZ consists of three parts:

1. Weapons firing position: locations where the munitions are fired.
2. Impact area: the target or intended area of munitions impact where munitions and munitions fragments are expected to land.
3. Secondary danger area: A safety buffer area where fragments from munitions may land.

Regulations require that SDZs are calculated so that there is only a one-in-one-million chance that munitions or munitions fragments would land outside the secondary danger area. There are two methods used for modeling SDZs: Deterministic and Probabilistic.<sup>3</sup>

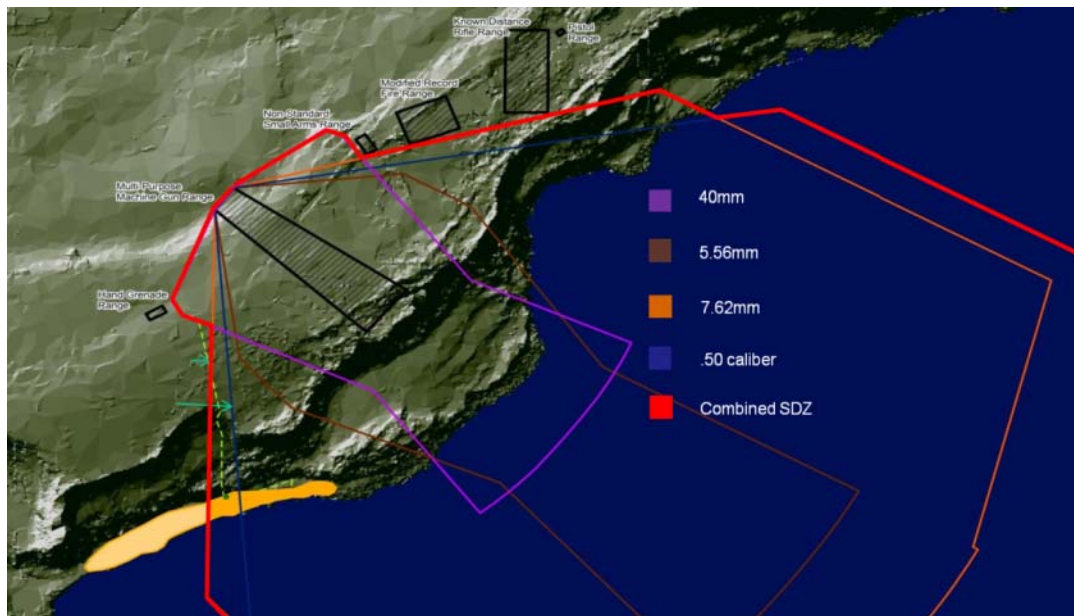
The methodology for establishing deterministic SDZs is based on a conservative approach that does not take into account specific physical information about the range area such as firing or target point height, topography, and precise firing and target locations. Deterministic SDZs can be placed over any terrain giving the commander maximum flexibility to safely accomplish all types of static and fluid live-fire training scenarios knowing there is only a 1:1,000,000 chance of a hazardous fragments landing outside of the surface danger zone.

The site-specific probabilistic methodology is used to establish very specific SDZs where site constraints limit a command's ability to establish and rely on a deterministic SDZ. A probabilistic SDZ is based on a detailed analysis that takes into account all aspects of the terrain,

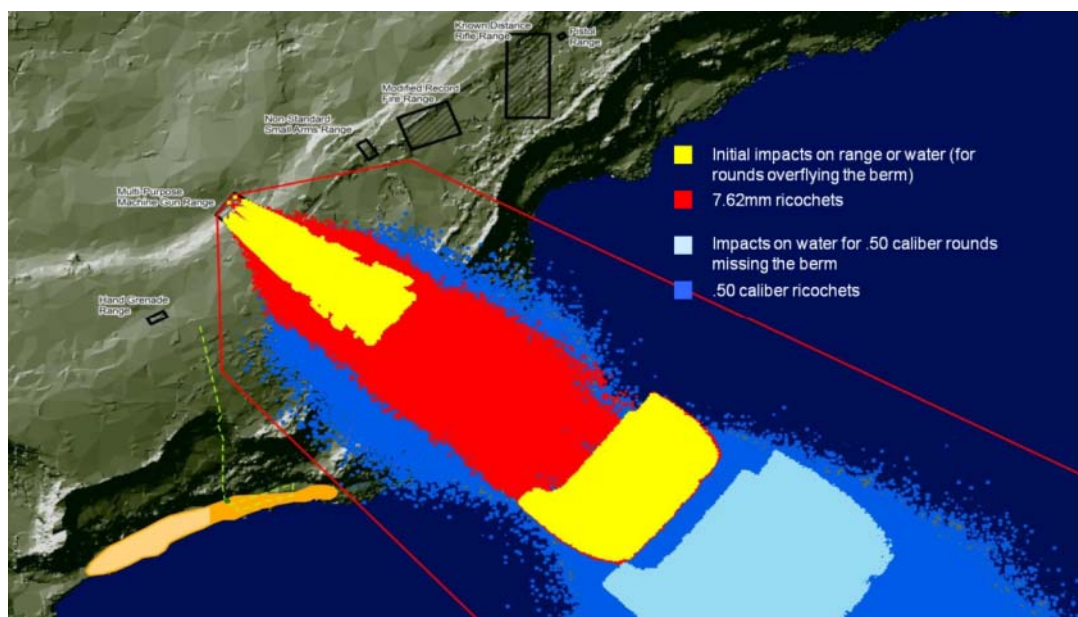
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<sup>3</sup> Deterministic modeling does not take into account site-specific conditions. As stated previously, probabilistic modeling takes into account site-specific conditions.

characteristics of the weapons being employed, specific firing positions, design of range safety features, and weather variables. Because it is based on specific conditions, the site-specific probabilistic SDZs may be smaller than a deterministic SDZ depending on physical constraints and limits imposed on training. Probabilistic SDZs maintain the requirement for a 1:1,000,000 chance of hazardous fragments landing outside of the surface danger zone for a specific, defined set of operating parameters. Such constraints can limit flexibility in future training. The following figures compare deterministic and probabilistic range modeling for a Route 15 range complex.



*Figure 2 - Deterministic SDZ*



*Figure 3 - Probabilistic SDZ*

## **Suitability and Feasibility Criteria**

In developing the Guam EIS, suitability and feasibility criteria were used to determine which locations are reasonable alternatives and to help identify a preferred alternative. The Navy applied these same criteria to determine whether previously excluded sites could be potentially reasonable using a probabilistic methodology for sizing the SDZ. The suitability criteria for the siting of live fire training ranges include the following:

1. Land availability for facilities including associated SDZs

*Application:* This criterion looks at the availability of existing DoD-owned property and available adjacent non-DoD property, as appropriate, to determine if sufficient unencumbered land area is available to construct and operate a live-fire training range complex (including both the range impact area and the SDZs). In addition, the land availability takes into account the practicality of acquiring adjacent land as necessary. For example, adjacent land that is developed with housing and community facilities is not considered to be practical land to acquire, whereas adjacent vacant or rural lands may be more practical to acquire.

2. Efficiently and effectively supports operational requirements

*Application:* This criterion evaluates how the location or its surroundings would effectively support or conflict with the operational requirements of a training range complex. This includes consideration of several factors such as appropriate site access, infrastructure, and the ability to site the ranges in a manner that meets the physical range requirements and achieves the training objectives.

3. Meets airspace requirements

*Application:* This criterion evaluates to what extent the vertical hazard associated with the firing ranges can be compatible with existing or modified airspace.

4. Efficiently and effectively supports training requirements

*Application:* A site is considered to efficiently and effectively support training requirements if it can host all of the live-fire training ranges in a single complex and is proximate to the non-live fire training ranges planned for Andersen South. For example,

alternatives where the SDZ of one range overlaps the firing points of another range would not meet this criterion.

5. Minimizes potential for encroachment

*Application:* Each site is analyzed for the potential of future growth to conflict with the military mission.

6. Compliance with anti-terrorism/force protection (AT/FP) requirements

*Application:* These are specific requirements to ensure the security of the ranges and associated personnel.

7. Consistent with military vision

*Application:* For this criterion, military vision is the planning and siting of military facilities and operations in a manner consistent with sound planning principles such as co-locating complimentary operations and land uses.

Feasibility criteria include the following:

1. Compatibility with present and future missions

*Application:* This criterion evaluates how the use of the site as a live-fire training range would affect current and projected military missions at the site. This would include the identification of unacceptable incompatible land uses such as the placement of a live-fire training range where an existing immovable fuel storage tank farm is located. Compatibility with adjacent off-site non-DoD land uses is also reviewed.

2. Environmental considerations (including presence of cultural resources, natural resource constraints, and terrain)

*Application:* Site specific environmental constraints or major obstacles are taken into consideration under this criterion, focusing on the resources noted. Important constraints include recovery habitat for endangered species located throughout Guam, or, as previously stated, 24/7 access to Pâgat Village and Pâgat Cave, and associated trail.

3. Efficiency of overall base development land use

*Application:* Alternatives will be evaluated to assess land use efficiency to include minimizing the amount of land required, access and compatibility with the surrounding environment, and proximity to cantonment and non-live fire training ranges on Anderson South.

### **SEIS Range Alternatives**

In order to establish the initial scope of the SEIS range alternatives, the Navy, through the Marine Corps Training and Education Command (TECOM), which is responsible for conducting range modeling for USMC installations, first applied the probabilistic methodology to the MPMG range at the Final EIS preferred alternative location to determine whether this approach would successfully avoid impacting access to Pāgat Village, Pāgat Cave and the associated trail. Upon application of the probabilistic methodology to the MPMG range, the Navy found that the revised SDZ did shrink to such a degree to avoid encumbrance of the Pāgat Village, Pāgat Cave and associated trail.

The Navy then took this reduced SDZ and overlaid it on all previously considered and discarded training range sites to determine if application of the probabilistic methodology had the potential to make these sites viable alternatives. This second look utilized the same criteria listed in the Final EIS, but now with a potentially smaller footprint for the MPMG SDZ to determine if any of the previously discarded sites should now be considered a potentially reasonable alternative and warrant site-specific probabilistic modeling. The Navy also evaluated sites introduced by the public through post-Final EIS comments. Navy and Air Force Barrigada were also considered, both individually as done in the Final EIS and together as one piece of property. The notional range layout, use and throughput remained the same as was discussed in the Final EIS.

The following locations were assessed to determine if a smaller SDZ (through application of the probabilistic methodology) could potentially make them a reasonable alternative for the training range complex:

- Navy Barrigada
- Apra heights and new Apra heights
- Dry Dock Island
- Mt. Santa Rosa
- Naval Hospital
- Nimitz Hill
- Polaris Point
- Tenjo Vista and Sasa Valley Tank Farm
- Potts Junction
- Andersen South
- Air Force Baragada
- Navy and Air Force Baragada Combination
- Andersen AFB Northwest Field
- NCTS Finegayan
- Andersen AFB – Tarague Beach
- Navy Main Base – Orote Point
- NAVMAG (or NMS)
- West Coast (Non-DoD Properties including GLUP 77, Former FAA, and Harmon properties)
- Route 15 Area – Alternative A – Adjusted Option
- Route 15 Area – Alternative B – Adjusted Option
- East/West Coast Combination
- Inarajan Southeast Coast
- Agat Southwest Coast
- Pago Bay
- Piti West Coast

The result of this analysis is that only the NAVMAG was found to be a candidate for application of site-specific probabilistic methodology.

The fourth step in determining the SEIS range alternatives was to model the probabilistic SDZ for the MPMG range at NAVMAG. The result is the SDZ for the MPMG can fit primarily (but not exclusively) on DOD property in multiple configurations.

Three potential alternatives were identified at NAVMAG: 1.) the North/South orientation; 2.) the East/West orientation, and; 3.) the “L-shape” orientation. By orienting the range north-to-south, some non-DOD property would be encumbered by the MPMG range SDZ. To orient the range in an east-west manner, firing points would need to be off NAVMAG in order to contain the SDZ within DOD property. A combination of the two orientations, referred to as the “L-Shape” orientation, included the MPMG range and associated SDZ in a north-to-south orientation and all other firing ranges being placed just outside the southeast boarder of NAVMAG in an east-west orientation. The “L-Shaped” orientation would also require the use of some non-DoD land.

The final step was to evaluate all three NAVMAG orientations (North/South, “L-Shape” and East/West) for feasibility based on the criteria established in the Final EIS and its impacts and compatibility on the existing military mission. The final result is that these three sites are potentially reasonable range alternatives and should be evaluated in SEIS.



## **SEIS Analysis**

The Final EIS provided detailed environmental review of two alternatives identified as Route 15 Options A and B. The SEIS will expand upon the Final EIS analysis with a focus on the changes in impacts associated with the Route 15 Options A and B re-sized to include the probabilistic SDZ, as well as analyze the three new alternatives within NAVMAG. Resources analyzed in the SEIS will be consistent with those in the Final EIS, with an emphasis on the resources directly or indirectly impacted by the proposed training range construction and operation.

**TECHNICAL REPORT**

# **Guam Live-Fire Training**

## **Range Alternatives**

In consideration of

# **Probabilistic Methodology**

## **Modeling**

**Published March 2012**

## **PURPOSE OF THIS REPORT**

The Navy published a Notice of Intent to prepare a Supplemental Environmental Impact Statement (SEIS) for a live-fire training range complex on Guam on February 10, 2012 (ChST). A document called the “Information Report” was also released at that time. The Information Report provides background on Marine Corps training requirements and the reasons why an SEIS is being prepared. The document also mentions that, following the identification of the probabilistic methodology as a way to meet commitment to 24/7 access to Pagat Village, Cave and the existing trail to these sites, the Navy conducted an analysis of previously considered alternatives to see if they would be viable options for the location of the training range. This Technical Report (TR) provides the details of that analysis.

The TR includes information known to the Navy when the report was prepared in the spring/summer of 2011. This analysis resulted in the identification of the Naval Magazine as a potentially reasonable alternative, and the conclusions in this document helped lead to the decision to prepare an SEIS.

The Navy encourages the public to review the TR and refer to it as appropriate when providing comments during the public scoping period, which is open until April 6, 2012 (ChST). Public comments combined with the studies to be conducted throughout the SEIS process, will help us ensure that we have thoroughly and completely considered potential alternatives and impacts of building and operating a live-fire training range complex on Guam.

## **Executive Summary**

This report evaluates locations previously considered and rejected as sites for the live-fire training range complex on Guam to determine if a smaller Surface Danger Zone (SDZ) would change previous conclusions on whether sites were reasonable alternatives for further consideration. The same suitability and feasibility criteria utilized to evaluate potential live-fire training alternative locations in the Final Environmental Impact Statement (EIS) for the Guam and CNMI Military Relocation were used to re-look at all sites. All military sites on Guam, with the exception of Rt. 15 Alternatives A&B, as well as the additional east and west coast non-Department of Defense (DoD) locations noted in the Final EIS are evaluated in this report. Also evaluated are four additional non-DoD sites that were raised by the public during review of the Final EIS.

As a result of this re-evaluation, it is recommended that one additional site, the Naval Magazine (NAVMAG), be modeled utilizing the probabilistic methodology to provide more information for decision-making purposes. Based on the analysis that follows, the Navy has determined that, with the exception of the NAVMAG, none of the other previously discarded potential training range sites would be a reasonable alternative even with a smaller SDZ footprint due to inability to meet established criteria.

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## PURPOSE

The purpose of this report is to take a second hard look at sites previously considered and rejected within the Guam and CNMI Military Relocation Environmental Impact Statement (EIS) process for locating a live-fire training range to determine if a smaller Surface Danger Zone (SDZ) would change previous conclusions on whether sites were reasonable alternatives for further consideration. In the Final EIS, numerous sites were initially considered for the proposed range complex. Sites were determined to be unreasonable alternatives if they failed to meet suitability and feasibility criteria and there were no means to mitigate the criteria shortfall. Many of the sites failed due to the lack of physical size of the site to fully accommodate the range and its' associated SDZs (together forming the range complex). Some sites were determined unreasonable due to the SDZs extending off-site that were incompatible with existing and/or proposed land uses or created conflicts with commercial and military airspace. Others were eliminated from further consideration due to the inability to meet other established criteria.

## BACKGROUND

Marine Corps Order 3570.1B establishes the USMC's range safety program. Department of the Army Pamphlet 385-63 describes Marine Corps' minimum safety requirements for SDZs based on weapon type. These SDZs assume a "worse-case" site condition – the deterministic methodology - that relies on generic rather than site-specific data. MCO 3570.1B, section 3-3, allows for a deviation in the size of an SDZ "when terrain, artificial barriers, or other compensating factors make a smaller SDZ safe." Typically, deviations under MCO 3570.1B are only for one year; however, Safety of Use Memorandum 8-09 provides for a permanent reduction in SDZ size when actual site characteristics and limitations on training are adopted in the modeling of safety danger areas. The probabilistic methodology was developed to determine site-specific SDZs.<sup>1</sup>

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<sup>1</sup> This probabilistic methodology was "developed under the auspices of the NATO Range Safety Working Group, International Range Safety Advisory Group, and the multinational Technical Cooperation Program ...." PSDZs "maintain the 1:1M chance of a hazardous fragment escap[ing] from the installation boundary." In addition to specific site conditions, PSDZs are also "based on a specific set of range parameters that do not change during training evolution, in addition to local weather considerations and munitions and weapon characteristics."

The probabilistic methodology has been used on existing ranges to determine a more accurate and validated footprint within which munitions/ricochets would land with the same statistical metrics as the more standard deterministic approach. Because the probabilistic methodology takes into account the actual terrain and other specifics of a range, it is able to be applied site-specifically and provide a more accurate SDZ. The probabilistic methodology was applied to the Multi-Purpose Machine Gun (MPMG) range for Route 15, Alternative A and, based on local conditions and the notional placement of firing points, the resultant probabilistic SDZ (PSDZ) was significantly smaller than the deterministic SDZ, while maintaining the same level of safety. It should be noted that the MPMG range was selected for application of the probabilistic methodology because, in terms of size and shape, it is the dominant range footprint and generally establishes the SDZ for the entire range complex.

This report is a review of all previously considered and eliminated sites to determine if application of a smaller SDZ changes previous conclusions as to the suitability and feasibility of those sites as reasonable alternatives. This review utilizes the same suitability and feasibility criteria listed in the Final EIS. No new potential alternatives are being created as a result of this review; however, in addition to sites identified in the Final EIS and public comments on the Final EIS, the Navy has modified one EIS alternative by combining two sites previously considered separately -- the adjacent Navy and Air Force Barrigada sites. In addition, where appropriate, the Navy also considered whether small range adjustments could impact a site's ability to meet established criteria; including the use of adjacent land.

## SITE EVALUATIONS

For purposes of this analysis, the following assumptions were established to apply the analysis on a consistent basis to all previously rejected sites:

1. Only sites discussed in the Final EIS or introduced by the public through post-Final EIS comments are evaluated with the single exception of combining Navy and Air Force Barrigada.

2. The notional layout of the ranges (relative locations of firing points and targets) utilized to assess potential sites in the Final EIS is used for this analysis because the range complex is already configured – to include overlapping SDZs – to minimize the range complex footprint. Therefore, there is little opportunity to reorient or modify the layout significantly. However, if there was undeveloped and/or unencumbered land available adjacent to an alternative, the Navy did consider whether range adjustments could impact a site's ability to meet established criteria. An example of this is at the NAVMAG.

3. Careful and deliberate spacing of the ranges is employed to ensure that firing points are not encumbered by the SDZ of adjacent ranges which enables such ranges to be used concurrently.

4. The co-location of live-fire ranges is an operational training priority to maximize training efficiencies as well as overlap SDZs to minimize impacted lands and waters.

5. The size of the range complex does not change from that reflected in the Final EIS with the exception of a smaller SDZ for the MPMG range.

The analysis of each site against suitability and feasibility criteria uses information from existing studies, plans and maps to evaluate whether the application of a smaller SDZ would result in a different conclusion on whether the site can be considered a reasonable alternative. Suitability criteria include:

1. Land availability for facilities (including associated SDZs)

*Application:* This criterion looks at the availability of existing DoD-owned property and, where appropriate, available adjacent non-DoD property to determine if sufficient



unencumbered land is available to construct and operate a live-fire training range complex (including both the range impact area and the SDZs). In addition, the land availability takes into account the practicality of acquiring adjacent land as necessary. For example, adjacent land that is developed with housing and community facilities is not considered to be practical land to acquire, whereas adjacent vacant or rural lands may be more practical to acquire.

2. Efficiently and effectively supports operational requirements

*Application:* This criterion evaluates how the location or its surroundings would effectively support or conflict with the operational requirements of a training range complex. This includes consideration of several factors, such as appropriate site access, infrastructure, and the ability to site the ranges in a manner that meets the physical range requirements and achieves the training objectives.

3. Meets airspace requirements

*Application:* This criterion evaluates the extent to which the vertical hazard associated with the firing ranges is compatible with existing or modified airspace.

4. Efficiently and effectively supports training requirements

*Application:* A site is considered to efficiently and effectively support training requirements if it can host all of the live-fire training ranges in a single complex. Alternatives where the SDZ of one range overlaps the firing points of another range would not meet this criterion.

5. Minimizes potential for encroachment

*Application:* This criterion evaluates the potential of future growth to conflict with the military mission.

6. Compliance with anti-terrorism/force protection (AT/FP) requirements

*Application:* These are specific requirements that ensure the security of the ranges and associated personnel.

7. Consistent with military vision

*Application:* This criterion evaluates the planning and placement of military facilities and operations in a manner consistent with sound planning principles such as co-locating complimentary operations and land uses.

Feasibility criteria include the following:

1. Compatibility with present and future missions

*Application:* This criterion evaluates how the use of the site as a live-fire training range complex would affect current and projected military missions at the site. This includes the identification of incompatible land uses such as the placement of a live-fire training range complex where an existing immovable fuel storage tank farm is located. Compatibility with adjacent off-site non-DoD land uses is also reviewed.

2. Environmental considerations (including presence of cultural resources, natural resource constraints, and terrain)

*Application:* Site-specific environmental constraints or major obstacles are taken into consideration under this criterion, focusing on the resources noted. Important constraints include recovery habitat for endangered species located throughout Guam, or 24/7 access to Pāgat Village and Pāgat Cave (and the associated trail).

3. Efficiency of overall base development land use

*Application:* Potential alternatives will be evaluated to assess land use efficiency to include minimizing the amount of land required, access and compatibility with the surrounding environment, and proximity to the main cantonment.

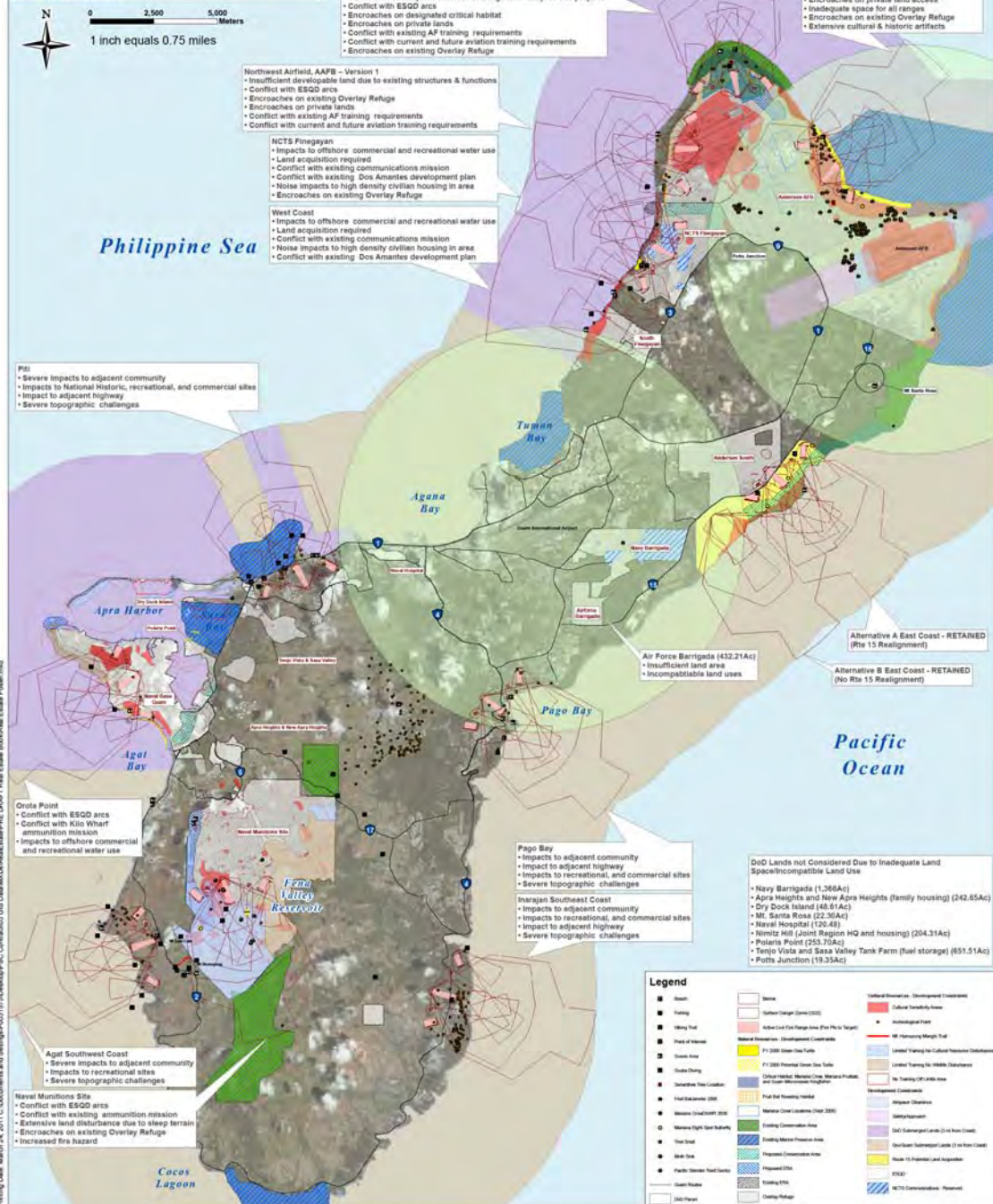
For each site in the following analysis, a conclusion is reached regarding whether a smaller SDZ would potentially result in a site becoming a reasonable alternative.

Figure 1 is a map of Guam that shows the relative location of potential range complex sites. The same notional range layout was utilized at each location to evaluate feasibility of accommodating the range footprints on site. This map is also utilized throughout the site evaluations to refer the reader to the various constraints that influence the assessment and conclusion.

*E-23*  
7



- AAFB - Tarague Beach
- Conflict with existing AF training requirements
- Conflict with AAFB airspace
- Conflict with ESQD arcs
- Extensive land disturbance
- Encroaches on private land access
- Inadequate space for all ranges
- Encroaches on existing Overlay Refuge
- Extensive cultural & historic artifacts



## ***Navy Barrigada***

**SIZE:** The Navy Barrigada contains 1,417 acres. At its widest, the site is approximately 3,750 meters on an east/west axis and approximately 2,400 meters on a north/south axis. Therefore, this site has adequate forward shooting distance from firing point to target exceeding the 1,000 meters necessary, but does not have adequate range from firing point to the SDZ extent, nor the needed acreage to accommodate the range complex SDZ. Because the Navy Barrigada property, by itself, is too small to accommodate the SDZ of the live-fire range complex, land acquisition would be required.

**LAND USE:** The Navy Barrigada site is currently used to support multiple functions. The southern “leg” of the site is utilized as the Nimitz Golf Course. It has been suggested in comments received that the golf course be used for the range complex, but the course is only 229 acres in size and is not large enough by itself to accommodate the complex and associated SDZ. The western portion of the site consists of communication facilities and existing antennas. Mt. Barrigada is on the property along the northern boundary in the central part of the site. The eastern half of the property is utilized for an existing transmitting antenna field. Land uses adjacent to Navy Barrigada include several communities with private homes and businesses in one of the more densely populated areas of the island. To the north of the site is the Won Pat International Airport (IAP).

**AIRSPACE:** A range complex at this location would violate the Federal Aviation Administration’s (FAA’s) prohibition on establishing a Restricted Area within 3 Nautical Miles (NM) of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

**OTHER CONSIDERATIONS:** As noted in the Final EIS, the orientation of the range should be offset from due east or west to avoid direct sight interference with the sun. Placement of a range on this property would require the SDZs either extending over Won Pat IAP or encumbering the neighborhoods of Asbeco, Mangilao, or Barrigada. This would require the acquisition of a large number of homes and other public and private facilities. Shooting directly

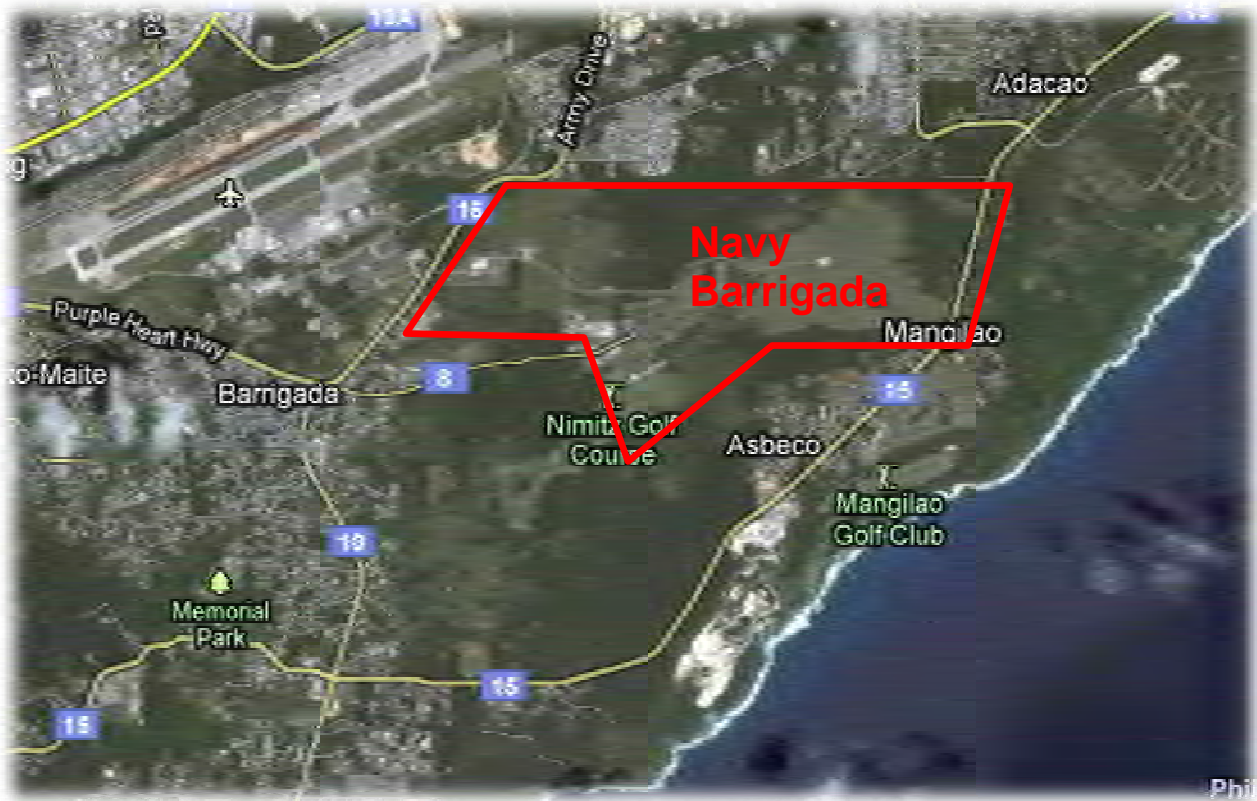
to the south would require the closure of Route 15 as it would be encumbered longitudinally by the SDZ. There would be no opportunity to re-route this road as all of the land between Navy Barrigada and the coast to the south would need to be acquired and all of the land on Navy Barrigada is accounted for. In addition, the SDZ would still extend into the adjacent near shore waters.

The vast majority of Navy Barrigada property is recovery habitat for the endangered Guam rail. Though the Guam rail is extirpated from Guam, live-fire range operations on this site would directly impact the habitat and require mitigation.

Two major sinkholes are noted within the golf course portion of the property providing additional placement challenges. A small wetland area exists in the very center of the property just to the west of the transmitting antenna field and would need to be avoided or mitigated.

**CONCLUSIONS:** The Navy Barrigada site is not considered a reasonable alternative because it would conflict with FAA's prohibition on establishing Restricted Airspace within 3 NM of a civilian use airport, the range and SDZs would require the acquisition of significant amounts of additional occupied land, the relocation of extensive communication assets that exist on site, and have significant land use conflicts and encroachment challenges (most of which would not be resolved by applying a smaller SDZ). Therefore it is unnecessary to further evaluate this site.

**Figure 2 – Navy Barrigada**



*(Note: This and following figures are not provided at a relative scale for comparison or with precise boundaries, but provided to give the reader an appreciation of the general setting and a view of local land uses. A more accurate depiction of property boundaries is provided in Figure 1.)*

## ***Apra Heights and New Apra Heights (family housing)***

**SIZE:** The Apra Heights and New Apra Heights Navy Housing site consists of 173 acres. The site is approximately 1200 meters on a northwest/southeast axis and approximately 300 meters on a northeast/southwest axis. Therefore, the site has adequate forward shooting distance from the firing point to targets, which exceeds the 1,000 meters necessary in one direction, but it does not have adequate range from firing point to the SDZ extent, nor the needed acreage to accommodate the range complex SDZ. If the range complex were aligned on the northwest/southeast axis to accommodate the forward shooting distance of the range proper, the property would not be wide enough on the perpendicular axis to place all of the ranges on the site. Because the Apra Heights property is too small to accommodate the range complex or the SDZ of the live-fire training range complex, land acquisition would be required.

**LAND USE:** The site is utilized for Navy family housing purposes and contains 260 housing units. The existing housing units would need to be demolished and Navy housing provided in an alternate location to replace the existing inventory requirement. Surrounding land uses include the Apra Heights reservoir, vacant land, agricultural/non-urban residential land uses, and community facilities (i.e., Church of Jesus Christ of Latter Day Saints and Navy office buildings (former McCool Elementary School)). Acquisition of additional property to contain the SDZs would result in land use incompatibilities from every direction of the Apra Heights site. The land acquisition would specifically impact other private residences, schools, or public/private facilities.

**AIRSPACE:** Placement of a live-fire training range complex at this location would have no impact to currently designated airspace on Guam.

**OTHER CONSIDERATIONS:** Acquisition of sufficient land to accommodate the entire range complex (including the SDZ) would result in the relocation or closure of public roads. Major roads potentially affected would include Routes 17, 2, and 5. This would result in a significant disruption to traffic flow patterns on the island. Acquisition would also require relocation of private and military housing, schools and community facilities, among others.



**CONCLUSIONS:** Based on size and adjacent incompatible land use, the Apra Heights site is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

**Figure 3 – Apra Heights**



## ***Dry Dock Island***

**SIZE:** The Dry Dock Island site is 28 acres and is located on a spit of land that reaches out into Apra Harbor. The site itself is not large enough to physically accommodate the layout of a single range or the range complex without reclaiming an extensive amount of submerged lands.

**LAND USE:** Operation of any ranges at this location would be incompatible with on-site and surrounding land and water uses. Fueling operations regularly occur at the Delta/Echo wharf area located on the northern portion of Dry Dock Island. Navy operations are also located to the south of Dry Dock Island and SDZs would conflict with these operations. The Port of Guam is located directly to the north of the island and would be forced to cease all operations when the range is in use. Commercial, Navy, and recreational boat and ship traffic occur on a constant basis within Apra Harbor and would also need to cease during range operations. Recreational sites as well as the community of Piti are located to the east and would be encumbered by any SDZs in that direction.

**AIRSPACE:** Placement of a live-fire range complex at this location would have no impact to currently designated airspace on Guam.

**OTHER CONSIDERATIONS:** Operation of a live-fire training range at Dry Dock Island would be a major disruption and would potentially have significant effects on species and habitats that exist within the adjoining biological environments of Outer Apra Harbor and Sasa Bay.

**CONCLUSIONS:** Based on its size, the Dry Dock Island site is not a reasonable alternative for further consideration. Additionally, severe land use incompatibilities confirm that Dry Dock Island is not a reasonable alternative for placement of a live-fire training range complex. The application of a smaller SDZ does not make this alternative potentially reasonable because the incompatibility with land/water use and adjacent communities as well as the impacts to natural resources would still be present. Therefore it is unnecessary to further evaluate this site.

**Figure 4 – Dry Dock Island**



## ***Mt. Santa Rosa***

**SIZE:** The Mt. Santa Rosa site is 18 acres in size. The property is no more than 305 meters wide in any direction and far less than the 1,000 meters range needed to accommodate the machine gun range. This option would require an extensive amount of land acquisition.

**LAND USE:** The Mt. Santa Rosa site is utilized by DoD for communication/radar facilities. Residential houses also are present off-site, but in the vicinity of the DoD facilities. Mt. Santa Rosa is also utilized as a recreational area because of the vistas from the higher elevations of the mountain. The placement of a live-fire training range complex at this site would be incompatible with existing DoD radar facilities, nearby private residences, and public recreational sites and parks. The communities of Gayinero and Lupog are in close proximity to the Mt. Santa Rosa site.

**AIRSPACE:** Operation of a range complex in this location would require integration with Anderson Air Force Base (AFB) Class D Airspace and airfield operations.

**OTHER CONSIDERATIONS:** Because the DoD site is atop a mountain, insufficient level surface exists to accommodate the laydown of a range complex. Even with an extensive amount of land acquisition, the mountain would need to be topped in order to provide sufficient level surface for the ranges from firing point to target.

**CONCLUSIONS:** Based on incompatible land use and airspace, and the physical inability to accommodate the training mission (size), this site is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable because the impacts to airspace and adjacent communities would still be present. Therefore it is unnecessary to further evaluate this site.



**Figure 5 – Mt. Santa Rosa**



## ***Naval Hospital***

**SIZE:** The Naval Hospital property is 120 acres in size. The site is approximately 1,500 meters long on its east/west axis and approximately 500 meters wide on the north/south axis. Although the site has enough distance on one axis to accommodate the 1,000 meters required for the machine gun range, the site is nevertheless insufficiently wide, rendering the site too small to accommodate the live-fire range complex. Land acquisition would be required to accommodate the range complex and SDZs.

**LAND USE:** The site itself contains the U.S. Naval Hospital for Guam. The 120-acre site is fully utilized. A new Naval Hospital is under construction at this site continuing to make this site incompatible and unusable. The site is surrounded by high density private residential, retail, and commercial development which would need to be demolished and relocated.

**AIRSPACE:** A range complex at this location would violate FAA's prohibition on establishing a Restricted Area within 3 NM of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

**OTHER CONSIDERATIONS:** None.

**CONCLUSIONS:** Due to the size of the site, severe encroachment, airspace conflicts, and potential impacts to the adjacent local community, this location is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable because the impacts to current and future land use of the DoD property, airspace, and adjacent communities would still be present. Therefore it is unnecessary to further evaluate this site.

**Figure 6 – U.S. Naval Hospital**



## ***Nimitz Hill (Joint Region and housing)***

**SIZE:** The Nimitz Hill Navy Housing area is 199 acres. The site is approximately 1,350 meters long on its north/south axis and approximately 450 meters wide on the east/west axis. Although the site has enough distance on one axis to accommodate the 1,000 meters required for the machine gun range, the site is not wide enough. The site is too small to accommodate the live-fire range complex. Land acquisition would be required to accommodate the range complex and SDZs.

**LAND USE:** Currently, 67 Navy housing units fully occupy the site. The use of the site as a range complex would be incompatible with its current use as Navy housing. The existing Navy housing would need to be demolished to allow for the use of this site for a range. To the north, west and south of the Nimitz Hill site are located private residences nearby in Asan, and Nimitz Estates and surrounding areas which would be affected by the SDZ and would require demolition and relocation. To the east of the site, private residences in Leo Palace Resort and Ordot and Sinajana villages are located about one and one-half miles away, but would still be in any SDZ that would result from ranges located on the Nimitz Hill site facing to the east. Additionally, the site is land-locked and would require land acquisition and use of the adjacent sites, which would encumber a significant amount of land that would be incompatible in use as well.

**AIRSPACE:** A range complex at this location would violate FAA's prohibition on establishing a Restricted Area within 3 NM of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

**OTHER CONSIDERATIONS:** None.

**CONCLUSIONS:** Based on the size, incompatible land use on and off site, incompatible airspace to the east and the physical inability to accommodate the training mission, this site is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this



alternative potentially reasonable because the impacts to airspace and adjacent communities would still be present. Therefore it is unnecessary to further evaluate this site.

**Figure 7 – Nimitz Hill Navy Housing**



## ***Polaris Point***

**SIZE:** The Polaris Point site is 253 acres and is located within both inner and outer Apra Harbor. The site consists of a northern and southern section with the northern section having a larger area approximately 850 meters by 900 meters, and the southern section as kind of a leg extending downward approximately 1,700 meters by approximately 220 meters. The site itself is not large enough to accommodate the physical layout of the ranges or to accommodate the SDZs.

**LAND USE:** Operation of any ranges at this location would be incompatible with on-site as well as surrounding land and water uses including Navy operations, the Port of Guam, harbor commercial and recreational traffic, recreation and the community of Piti to the northeast. Current operations at Polaris Point include a home-ported submarine tender vessel, and submarine berthing at Alpha and Bravo piers.

**AIRSPACE:** Placement of a live-fire range complex at this location would have no impact to currently designated airspace on Guam.

**OTHER CONSIDERATIONS:** Operation of a live-fire training range at Polaris Point would be a major economic disruption and force the termination of many commercial, recreational and other military activities in the area.

**CONCLUSIONS:** Based on size and incompatible land uses, this site is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable because the impacts to current and future land use of the DoD property, and adjacent communities/harbor would still be present. Therefore it is unnecessary to further evaluate this site.

**Figure 8 – Polaris Point**



## ***Tenjo Vista and Sasa Valley Tank Farms (fuel storage)***

**SIZE:** The Tenjo Vista and Sasa Valley Tank farm areas are 421 acres in size. The site is approximately 2,800 meters long on its longest axis that is northwest/southeast and approximately 1,200 meters at the widest part of the perpendicular northeast/southwest axis. The site is not large enough to contain the SDZs of a range complex and land acquisition would be required.

**LAND USE:** This site is used as a military fuel storage area making it completely incompatible with a live-fire training complex at the same location. The tank farm would need to be relocated if the range were constructed and operated at this site. To the north (immediately across Route 6) is a community of private residences (more than 100 houses and two multi-story condominium towers) that would be within the SDZ if the range was oriented northward. The community of Piti would be equally impacted by the presence of the range at this location.

**AIRSPACE:** Placement of a live-fire range complex at this location would have no impact to currently designated airspace on Guam unless oriented to the northeast, east or southeast, in which case it would violate FAA's prohibition on establishing a Restricted Area within 3 NM of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

**OTHER CONSIDERATIONS:** None.

**CONCLUSIONS:** This Sasa Valley Tank Farm site does not have the size to accommodate the SDZs and has conflicts with on and off site land uses, airspace issues to the east, and community land use conflicts to the north. Based on these factors, this site is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

**Figure 9 – Sasa Valley**



## ***Potts Junction***

**SIZE:** The Potts Junction site is 20 acres in size. The site is no more than approximately 300 meters by 275 meters. This site is too small to accommodate the physical lay down of the range complex or the forward firing distance of a live-fire range and would require land acquisition to the south or use of existing DoD lands to the northeast, north, northwest, or west.

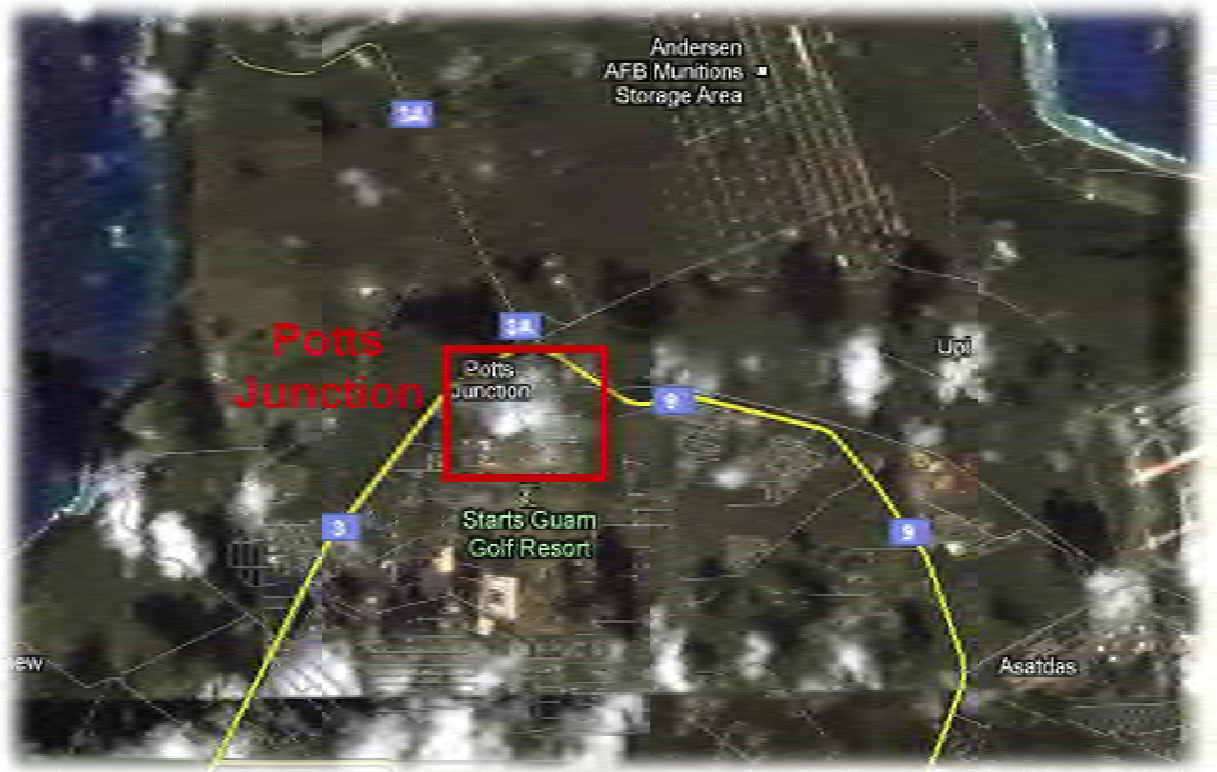
**LAND USE:** Potts Junction is a former Air Force fuel storage facility. The site is land-locked and would require additional adjacent land to accommodate the range complex (including SDZs). To the east, north and west of this site is DoD property and to the south are densely developed private properties. Immediately to the north is the western portion of Anderson AFB. Acquisition of sufficient land to accommodate the entire range complex to the south of Potts Junction would be required, and would impact an area of dense residential development. Placement of the range complex to the west or northwest would also necessitate acquisition of private lands. The SDZs would extend over adjacent waters such as Double Reef which are active recreational spots and were specifically identified by members of the Guam government as being of high commercial value for tourism, fishing and related recreation uses.

**AIRSPACE:** Operation of a range complex in this location would require integration with Anderson AFB Airspace and airfield operations.

**OTHER CONSIDERATIONS:** Use of this site in conjunction with DoD property to the north would necessitate relocating Route 3 to the south of Potts Junction.

**CONCLUSIONS:** Based on size and incompatible land uses, this site is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

**Figure 10 – Potts Junction**



## ***Andersen South***

**SIZE:** Andersen South site is 2,061 acres in size. The site is approximately 4,500 meters across on the east/west axis and approximately 2,400 meters across on the north/south axis at the mid-point of the property. The site lacks the size to contain the SDZs if the range were to be constructed and operated at this site. Land acquisition of adjacent property would be required.

**LAND USE:** Andersen South property is surrounded to the east, north and west by residential developments abutting the property boundary. The residential communities immediately adjacent to Andersen South include Perez Acres, Yigo, Ipapao, South Acres, and Adacao. This is a very dense, heavily-populated area featuring condominiums, housing, churches, schools, recreation, retail, and small businesses. To the south/southeast is the Route 15 property that is identified within the Final EIS as the preferred alternative for the live-fire training range complex. It is reasonable to assume that the location of the ranges on Andersen South would utilize the same orientation as that proposed by the Route 15 Alternative A (preferred alternative) approach. This would result in more land and less near shore waters enveloped by the range SDZs with the probabilistic SDZs likely to encumber Pagat Cave, Pagat Village, and the trail leading to those sites.

Use of the Andersen South property for live-fire training ranges would preclude the use of this site for non-live-fire training due to insufficient area to accommodate both types of training footprints and require the relocation of the non live fire training range elsewhere on Guam.

**AIRSPACE:** A range complex at this location would violate FAA's prohibition on establishing a Restricted Area within 3 NM of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

**OTHER CONSIDERATIONS:** This alternative would require the acquisition of the residential neighborhood immediately north of the Guam International Racetrack. Placement of the range firing points at Andersen South would also move the ranges closer to adjacent residential areas, increasing noise impacts associated with the live-fire training. Finally,



implementation of this alternative would likely require the permanent closure of Route 15 as a public thoroughfare on the island of Guam. Locating the ranges on the property would preclude re-routing of Route 15 as the preferred alternative described in the Final EIS allows, and the roadway could not remain operational within the midst of the SDZs. This would result in significant shifts of island traffic patterns.

**CONCLUSIONS:** Based on the potential significant land use incompatibilities with surrounding residential areas, the impact to airspace and the need to close Route 15, this option is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

**Figure 11 – Andersen South**



## ***Air Force Barrigada***

**SIZE:** The Air Force (AF) Barrigada property contains 432 acres. The site measures approximately 1,250 meters across on the east/west axis and approximately 1700 meters on the north/south axis. The site is too small to accommodate the range complex or the associated SDZs. Land acquisition of adjacent properties would be required.

**LAND USE:** Land use on AF Barrigada consists of a portion of the site that hosts the Next Generation Radar (NEXRAD), which provides weather radar capabilities for the FAA. This use is incompatible with a live-fire training range complex. To the north of AF Barrigada is the Navy Barrigada property with the Won Pat IAP further north. To the west and southwest of the property is the village of Barrigada - a heavily populated area. To the southeast of the property is open land, Route 15 and the coastline. South of the property is a residential community.

The only feasible direction of fire would be to the southeast, with resultant constraints similar to those addressed for the Andersen South option. The residential properties south of the AF Barrigada would need to be acquired and demolished to accommodate a live-fire range at this site. Route 15 would need to be acquired and possibly closed, thus disrupting traffic flow to communities further to the east and northeast coastal sections of Guam. The SDZs would extend over the adjacent off-shore waters similar to the Route 15 preferred alternative.

**AIRSPACE:** A range complex at this location would violate FAA's prohibition on establishing a Restricted Area within 3 NM of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

**OTHER CONSIDERATIONS:** Approximately half of the AF Barrigada property is recovery habitat for the Guam rail.

**CONCLUSIONS:** Based on the lack of size, existing radar facilities, incompatibility with a large adjacent residential area, airspace conflicts, and Route 15 impacts, this site is not

considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

**Figure 12 – Air Force Barrigada**





**Figure 12A –  
NEXRAD Facility at AF  
Barrigada.**

## ***Navy and Air Force Barrigada Combination***

This scenario (a combination of Navy and Air Force Barrigada properties) was not previously considered, but is included in this review to ensure that a comprehensive evaluation of sites was completed.

**SIZE:** The combined acreage of Navy and AF Barrigada is 1,849 acres. Although the two properties are adjoining, they are only connected by a small leg from the Navy Barrigada site. The physical layout of the two properties does not complement each other in a manner that would accommodate the range complex. Therefore, land acquisition of adjacent properties would be required. The likely layout of the ranges would necessitate an orientation to the southeast.

**LAND USE:** The land uses on and off-site remain the same as discussed for the individual sites above. The location of a range complex across these two DoD properties, oriented to the southeast, would result in the loss of the residential neighborhood to the south of AF Barrigada and the loss of the community of Asbeco, the Mangilao Golf Club and the quarry operation to the south and southeast of Navy Barrigada.

**AIRSPACE:** Both properties are located within the 3 NM radius of Won Pat IAP. A range complex at this location would violate FAA's prohibition on establishing a Restricted Area within 3 NM of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

**OTHER CONSIDERATIONS:** As noted under each of the individual sites, both Navy and AF Barrigada include recovery habitat for the Guam rail.

**CONCLUSIONS:** The combination of the Navy and AF Barrigada sites is not a reasonable alternative for the same reasons that the individual sites fail. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

## ***Andersen AFB-Northwest Field (NWF)***

Initially, only the placement of the Known Distance (KD) range was evaluated on the eastern portion of the property. During internal Navy discussions and document reviews in preparation of the September 2010 ROD (which deferred the decision on training ranges), two additional notional layouts for a range complex at Andersen AFB NWF were considered. The two notional sites referred to as Versions 1 and 2 were developed at NWF taking into consideration the Explosive Safety Quantity Distance (ESQD) arcs from existing munitions storage facilities that encumber a large portion of NWF. The evaluation below focuses on these two notional settings.

### ***VERSION 1***

**SIZE:** Andersen AFB NWF is 4,366 acres in size. On the northeast/southwest axis the distance across the property is approximately 6,100 meters and on the northwest/southeast axis the property is approximately 3,800 meters. The site is large enough to site the range complex (1,000 meters), but would not have the range from the firing point to the extent of the SDZ to accommodate the entire SDZ. The notional footprint of Version 1 would extend the SDZs across the adjacent near-shore waters.

**LAND USE:** A large portion of the site is either currently used for existing DoD missions (including ESQD arcs) or for planned missions (See Figure 13B below). Northwest Field is an airfield with two parallel runways and is utilized for expeditionary operations. As noted in the draft Guam Joint Military Master Plan (GJMMP), use of this site for a firing range would eliminate the only outlying landing field (emergency runway) for aviation on Guam, which is considered critical to the existing mission. Areas surrounding the North Runway and operating area are being developed by Pacific Air Force (PACAF) to bed-down their Rapid Engineers Deployable Heavy Operational Repair Squadron Engineer (RED HORSE) operational unit and the Combat Communications, Silver Flag, and Commando Warrior training schools. Planning and approval of these programs pre-date the Guam and CNMI Military Relocation action. The notional placement of Version 1 conflicts with current plans and construction of the RED HORSE unit, overlying the same footprint.

Much of NWF is currently used for magazine munitions storage. Each of these magazines has an associated ESQD arcs that is defined by the type of material stored and the construction of the magazine itself. Version 1 could be sited to not conflict with the existing ESQD arcs.

To the west is Urunao, a strip of private property immediately along the shoreline. Placement of a range complex utilizing the Version 1 footprint would require SDZs that encumber this property and require DoD acquisition of private residences, beaches and a day use beach resort among other similar activities along the Urunao shoreline.

Version 1 would also require the relocation of Route 3A, the only means of access to the Ritidian Point (Wildlife Refuge) area and Urunao properties.

**AIRSPACE:** Version 1 at NWF, as notionally sited and shown in Figure 1, would have no compatibility issues with existing designated airspace on Guam. However, establishment of live-fire ranges would potentially create vertical hazards to existing and future aviation training activities at the NWF airfield. Version 1 would place the range complex on the western side of NWF in the approach/departure pattern for the airfield at NWF. Although expeditionary flight operations occur here irregularly, the presence of the ranges at this location would impact those activities.

**OTHER CONSIDERATIONS:** The range complex would be oriented to the west for Version 1 with associated SDZs extending offshore. This would encumber the private land immediately along the coast. All of NWF is located within the Overlay Refuge area.

**CONCLUSIONS:** Use of this site would require significant investment to relocate and/or mitigate impacts to existing Air Force missions. Combined with impacts on Route 3A and the Urunao community, Version 1 for NWF is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

## **VERSION 2**

**SIZE:** Andersen AFB Northwest Field is 4,366 acres in size. On the northeast/southwest axis the distance across the property is approximately 6,100 meters and on the northwest/southeast axis the property is approximately 3,800 meters. The site is large enough to site the range complex, but would not have the range from the firing point to the extent of the SDZ to accommodate the entire SDZ. The notional footprint of Version 2 for NWF would extend the SDZs across the adjacent near-shore waters.

**LAND USE:** As mentioned in the discussion on Version 1, a large portion of the site is either currently used for existing DoD missions (including ESQD arcs) or for planned missions (See Figure 13B below). NWF is an airfield with two parallel runways and is utilized for expeditionary operations. Sites surrounding the North Runway and operating area are being developed by PACAF to bed-down their RED HORSE operational unit and the Combat Communications, Silver Flag, and Commando Warrior training schools. Planning and approval of these programs pre-date the Guam and CNMI Military Relocation action. The notional placement of Version 2 is on the very edge of the development footprint of these other missions and could conflict with those operations.

Much of NWF is currently used for magazine munitions storage. Each of these magazines has an associated ESQD arc that is defined by the type of material stored and the construction of the magazine itself. Version 2 could be sited to not conflict with existing ESQD arcs.

Off site to the north is a strip of non-DoD property along Ritidian Point that would be encumbered by the SDZ if Version 2 were utilized. This area (approximately 300 acres) is the Ritidian National Wildlife Refuge owned by the US Fish and Wildlife Service and designated as critical habitat. This is further discussed in the “Other Considerations” section below.

**AIRSPACE:** Version 2 at NWF, as notionally sited and shown in Figure 1, would have no compatibility issues with existing designated airspace on Guam. However, establishment of live-fire ranges would potentially create vertical hazards to existing and future aviation training activities at the NWF airfield.



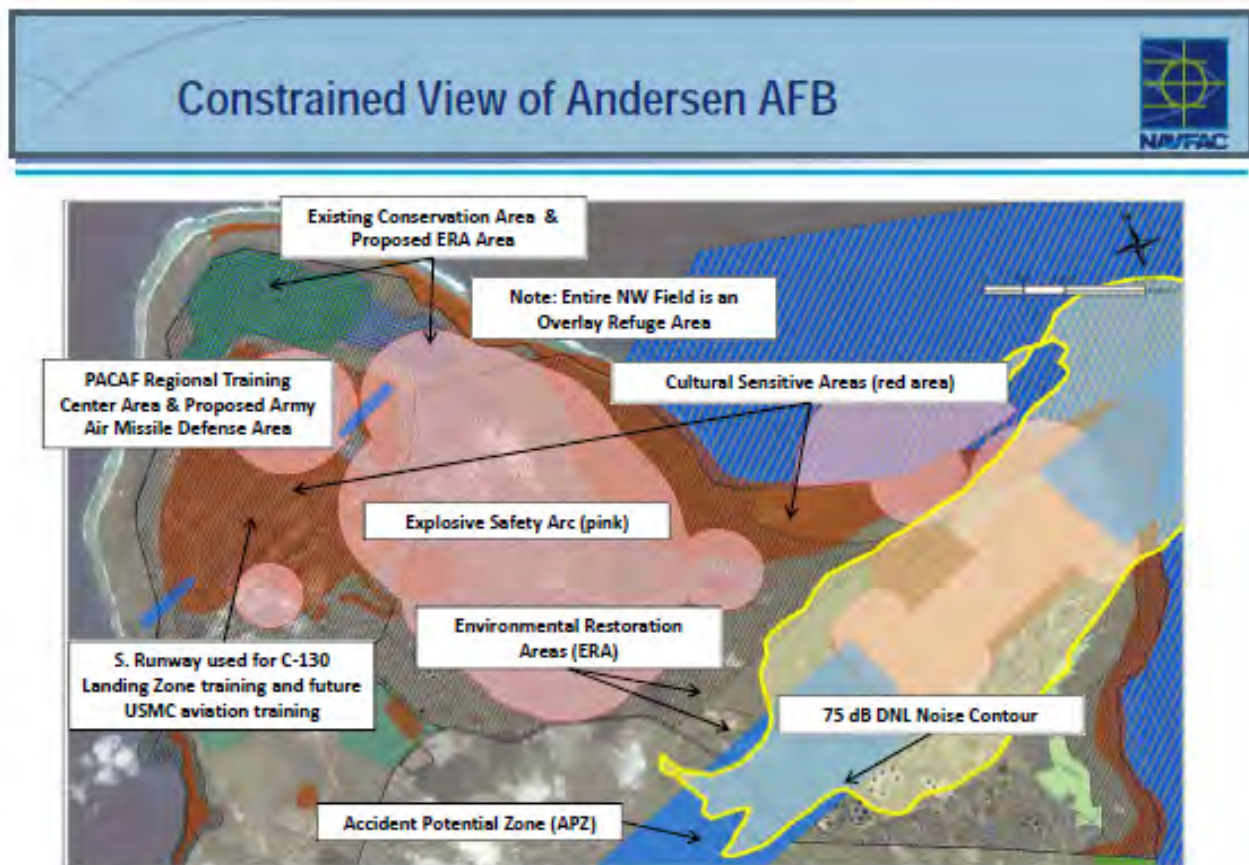
OTHER CONSIDERATIONS: The ranges would be oriented to the north for Version 2, with SDZs extending offshore. This would encumber the non-DoD land immediately along the coast. All of NWF is located within the Overlay Refuge area. An important consideration affecting NWF and placement of the range complex is the large area established through ESA Section 7 consultation as a mitigation area for previously planned construction actions at Andersen AFB. The mitigation area was established as a result of the Andersen AFB ISR Strike project and is included in the footprint of the proposed Version 2. The mitigation area pre-dates the planning for the Guam realignment. Loss of this mitigation area would require replacement of like mitigation at another location and may require re-opening Section 7 consultation under ESA for the ISR Strike.

CONCLUSIONS: Because of land use incompatibilities with existing Air Force missions (including RED HORSE, Combat Communications, Silver Flag, Commander Warrior Training School, and existing and future aviation training activities at the NWF airfield), as well as potentially significant impacts to a previously-consulted and established mitigation area associated with ISR Strike, NWF Version 2 is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

**Figure 13A – Andersen NWF Version 1 and Version 2**



Figure 13B - Andersen NWF Constraints



## ***Naval Communications and Telecommunications Stations (NCTS) Finegayan***

**SIZE:** NCTS Finegayan is 2,415 acres. The property is approximately 2,300 meters wide on its northwest/southeast axis and approximately 4,000 meters on its northeast/southwest axis. There is enough property at NCTS Finegayan to accommodate the range complex; however it could not contain the extents of the SDZ. The notional footprint would extend the SDZ across the adjacent near-shore waters.

**LAND USE:** The property is bounded by the former FAA property to the south, the village of Dededo to the east, Andersen Air Force Base NWF to the northeast, and the remainder by coastline/cliff line. Placement of a range complex on this property would require orienting the range to the west-northwest with SDZs extending out over offshore waters. Currently on site are facilities and antennas that provide critical communications for Navy operations. These antennas would have to be relocated to render the northern half of the property usable for a range complex (the antennas have a stand-off distance often referred to as a “look angle” which must be taken into account when placing adjacent facilities/operations). This leaves only the western portion of the southern half of NCTS Finegayan as an unencumbered area for the range complex. That area does not provide sufficient width to accommodate the entire range complex with ranges sufficiently separated to allow for simultaneous operation. As notionally sited, the range complex would not be compatible with the existing antennae fields on NCTS Finegayan. Avoidance of the antennae fields would require the acquisition of private and FAA property west of Andersen AFB. In addition, NCTS Finegayan contains extensive underground communications cable networks which are highly valuable national communications assets. Additionally, NCTS Finegayan was selected in the September 2010 ROD to house the main cantonment for relocating Marines. Placement of a range at this location would directly conflict with future plans for the site.

**AIRSPACE:** Placement of a live-fire range complex at this location would have no impact to currently-designated airspace on Guam; however, if the range were oriented to the south, the resultant SDZ would violate FAA's prohibition on establishing a Restricted Area

within 3 NM of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

OTHER CONSIDERATIONS: Several recreational sites would be adversely affected and no longer available for daily use because of their relative location within the SDZs. Some of the more common recreational sites affected would include Double Reef, Double Reef Beach, Double Reef Beach Trail, Ague Cove, Ague Point, Dolphin Point, Ague Cove Trail, Haputo Beach, Haputo Point Overlook, and Haputo Beach Trail. This would also affect other recreational resources such as boating, swimming, snorkeling, and scuba diving. Additionally as noted at page 2-14 of Volume 2 of the Final EIS, much of the undeveloped lands within NCTS Finegayan are a part of the Overlay Refuge.

CONCLUSION: Because of land use incompatibilities and significant impacts to natural resources and public recreation, this is not considered a reasonable alternative for the range complex. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

**Figure 14 – NCTS Finegayan**



## ***Andersen AFB-Tarague Beach***

**SIZE:** The acreage of the Tarague Beach site is approximately 280 acres. The property is approximately 3,700 meters long on its northwest/southeast axis and approximately 1,350 meters wide on its northeast/southwest axis. The SDZs would extend out over the near shore waters.

**LAND USE:** Tarague Beach is located on Andersen AFB just to the north of the main airfield along the shoreline. A single small arms range is currently operated in the southeast portion of this site for Air Force personnel. This small arms range is insufficient to meet the requirements of Marines relocating to Guam. The site is bounded by the airfield to the south and southeast and the Anderson AFB munitions storage area to the west.

The site is partially located on a cliffside with very uneven terrain extending down from the upper elevation to the beach. The topographic relief across this site is about 500 feet over a span of an approximate 1,100 meter width. Construction of the range complex would require extensive excavation of the cliffside.

In addition, this site is not large enough to accommodate the entire range complex without re-locating existing magazines within the munitions storage area. The magazines currently produce an ESQD arc that would encumber a portion of the proposed site. Because munitions stored in the magazines directly support operations at Anderson AFB, re-locating magazines further from the air field operations would negatively affect the Air Force.

**AIRSPACE:** Placement of the range complex at this location would conflict with the Class D airspace of Anderson AFB airfield. Operation of a range complex in this location would require integration with Anderson AFB Airspace and airfield operations.

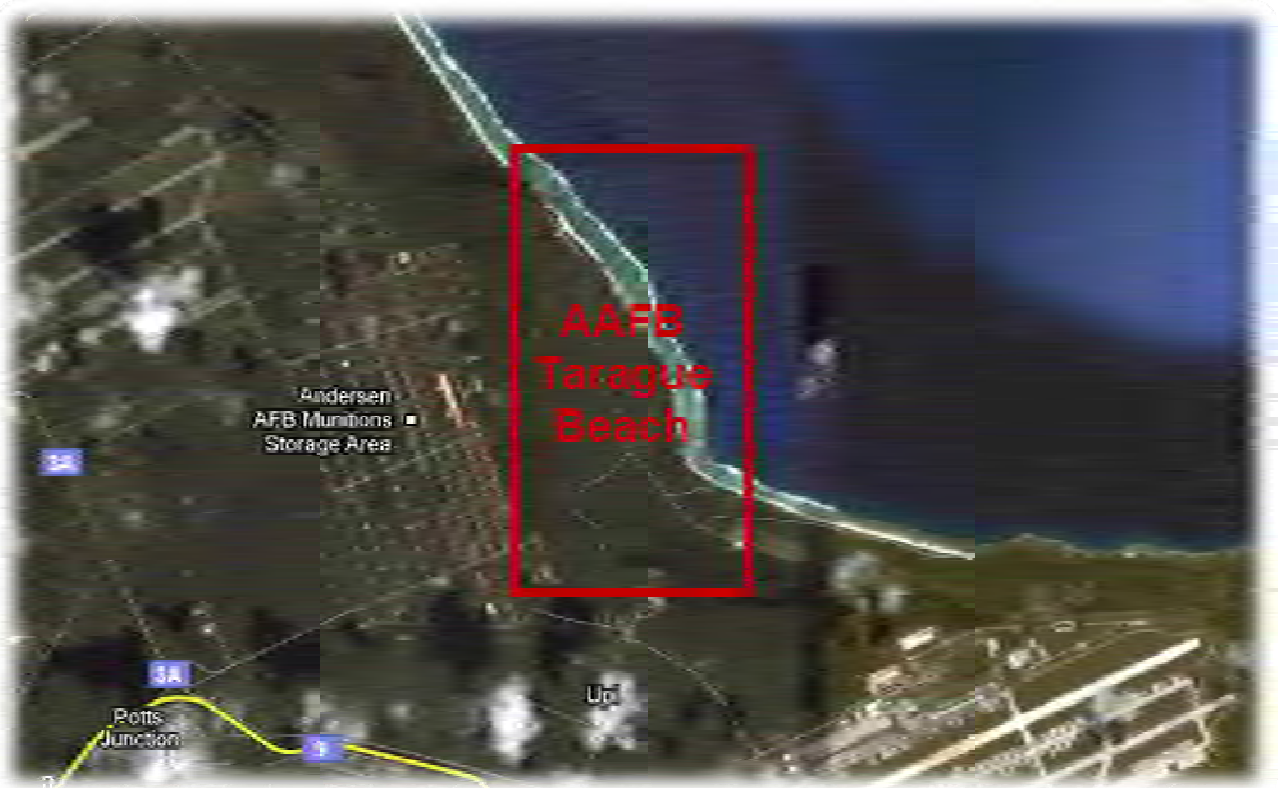
**OTHER CONSIDERATIONS:** The shore-side earthwork could have a negative impact on Tarague Beach, which is the island's prime sea turtle nesting area. Operations of the range at this location could also negatively impact marine species (especially nesting sea turtles) due to the noise generated by the use of the range. Tarague Beach also contains recovery habitat for the Mariana fruit bat and the Guam Micronesian kingfisher. The coconut plantation adjacent to

Tarague beach is considered a Priority 2 recovery area and foraging area for the endangered Mariana crow.

Cultural resources studies conducted at Anderson AFB have concluded that the cliff-side above Tarague Beach has numerous culturally significant sites. The earthwork that would be required to level out the site would have a potentially significant adverse impact on this resource.

**CONCLUSIONS:** Because of land use incompatibilities, terrain, existing magazines and associated ESQD arcs, incompatibility with existing airspace for Anderson AFB airfield, and natural and cultural resource constraints, this alternative is not considered reasonable. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

**Figure 15 – Andersen AFB Tarague Beach**





## ***Navy Main Base-Orote Point***

**SIZE:** Navy Main Base Orote Point is comprised of approximately 2,300 acres. The property is approximately 5,250 meters long on an east/west axis and approximately 2,600 meters wide on its north/south axis. The range complex would fit on the property, but the SDZs would extend out over the adjacent near shore waters. Figure 1 shows the notional placement of the range complex oriented to the southwest over Agat Bay.

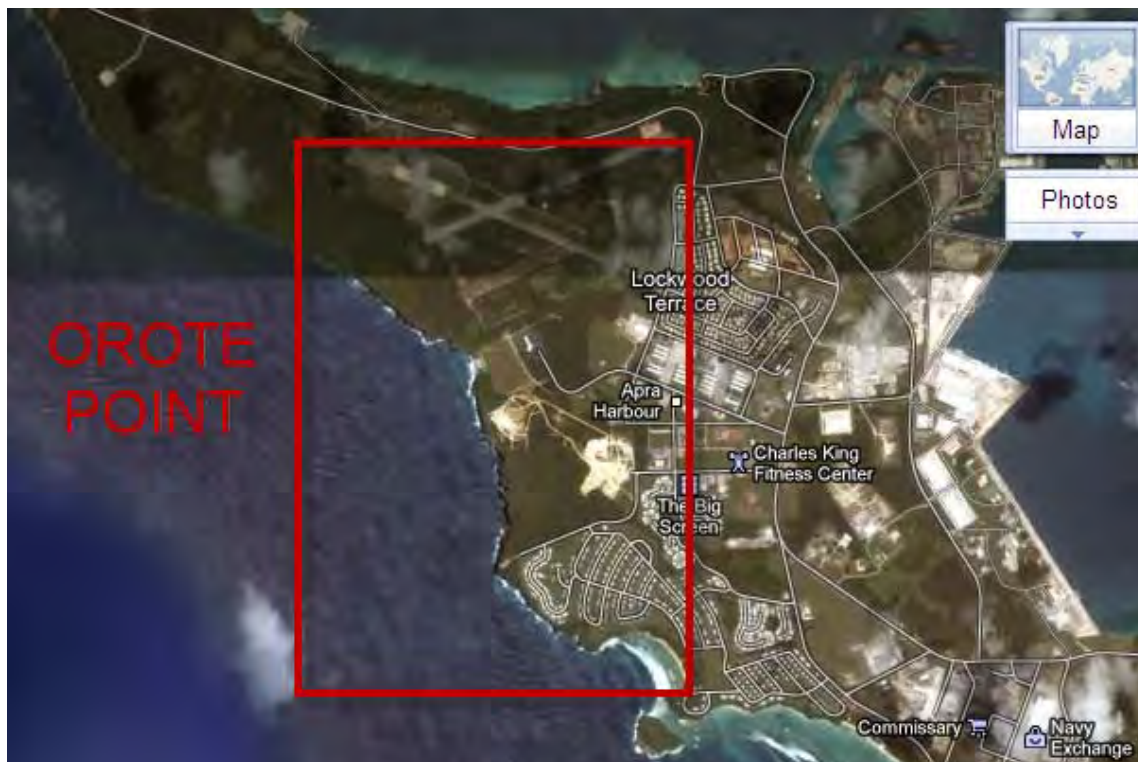
**LAND USE:** Location of the range complex on Orote Point would require the removal of a vast amount of occupied Navy housing. In addition, the impact areas would require removal of the Orote Airfield. Additionally, the use of Orote Point for a range complex would conflict with the operational use of Kilo Wharf just to the northwest of the site. Ammunition ships utilize Kilo Wharf to load and off-load ammunition and these operations are vital to Pacific Command (PACOM) munitions requirements in the Western Pacific and cannot be relocated or curtailed. Future plans include construction of ammunition magazines to fulfill a current storage deficiency. The projected use of Kilo Wharf for ammunition handling after the buildup is approximately 245 days per year. Because Marines could not operate the range complex during those ammunition handling periods, this range complex location would be unable to accommodate the projected training needs and fail to meet mission requirements. Lastly, use of the site would result in SDZs that would extend over adjacent offshore waters to the southwest of the site that would conflict with commercial and recreational uses.

**AIRSPACE:** Placement of a live-fire range complex at this location would have no impact to currently designated airspace on Guam; however, placement of the range complex as shown would preclude the use of the airfield at Orote for current and future aviation operations.

**OTHER CONSIDERATIONS:** The Navy established the Orote Peninsula Ecological Reserve Area (ERA) in 1984 as a mitigation measure for the construction of Kilo Wharf. The Orote ERA includes 133 acres of submerged lands and 30 acres of terrestrial property. Use of this area would require identification of additional mitigation for these impacts.

**CONCLUSIONS:** Based on the conflict with military mission at Kilo Wharf, the disruption to Navy family housing, significant impacts on recreational and commercial activities, and impacts on natural resources, this site is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

**Figure 16 – Orote Point**



## ***Naval Magazine (NAVMAG) (or Naval Munitions Site)***

**SIZE:** The Naval Magazine (NAVMAG), often referred to as the Naval Munitions Site (NMS), is comprised of approximately 8,645 acres. The property is approximately 5,800 meters wide on its east/west axis and approximately 8,685 meters long on its north/south axis. Overall, the area has sufficient acreage to accommodate the range complex. The northern half of the NAVMAG consists of numerous munitions magazines and the presence of Fena Reservoir. The southern portion of NAVMAG remains largely undeveloped.

**LAND USE:** The site is located in southern Guam in a setting of extreme and challenging terrain. The northern half of the NAVMAG is constrained by numerous munitions magazines and the presence of Fena Reservoir. Munitions storage is the primary mission of the NAVMAG and large ESQD arcs exist over most of the northern portion of the site, restricting land uses for almost the entire northern half of the property. NAVMAG is operationally managed by the Naval Munitions Command East Asia Division (NMC EAD) and munitions stored in the magazines primarily support operations throughout East Asia through operations at Apra Harbor and Anderson AFB. The southern portion of NAVMAG is characterized by extreme topography, much of which is considered undevelopable. Any alternative proposed for the southern half would require the acquisition of additional land. The land to the east is mostly unencumbered private or GovGuam land. Furthermore, extensive earthwork would be needed to level areas for some of the ranges.

**AIRSPACE:** Placement of a live-fire range complex at this location would have no impact to currently designated airspace on Guam.

**OTHER CONSIDERATIONS:** NAVMAG contains large areas of freshwater habitats. The majority of NAVMAG is designated as Overlay Refuge lands, and recovery habitat is present for the Mariana Crow, Guam Micronesian kingfisher, the Mariana fruit bat, Guam rail, and *Serianthes nelsonii*.

The majority of the southern half of NAVMAG is noted in the Final EIS with a “medium” probability of archaeological areas present on site. This is interspersed with some “high” and “low” probability areas as well.

**CONCLUSIONS:** NAVMAG shares many of the difficulties of other sites; however, the possibility of a smaller SDZ would allow a range complex to be located mostly on DoD property. In addition, there is significant unencumbered land surrounding portions of NAVMAG. The possibility of placement of the range complex on compatible lands (similar to Rt. 15), or almost entirely within DoD-owned land warrant recommending that this site be fully modeled using the probabilistic methodology to evaluate whether it is a potentially reasonable alternative.

**Figure 17A – Naval Munitions Site**



**Figure 17B – Naval Munitions Site ESQD Arcs**



***West Coast (non-DoD Properties including Guam Land Use Plan (GLUP) 77, Former FAA, Harmon properties)***

SIZE: The GLUP 77 property is 450 acres, the Former FAA property is 681 acres, and the Harmon property is 330 acres. The total of these three properties is 1,561 acres. The three properties measure approximately 2,500 meters on their northeast/southwest axis and approximately 2,300 meters on their southeast/northwest axis. The site would not be large enough to contain the associated SDZs, which would extend out over the adjacent near shore waters.

LAND USE: Currently, the three properties are undeveloped, although there may be some temporary facilities or uses of the properties. The lands are under the ownership of various private and GovGuam entities.

A land use plan known as the Dos Amantes plan was developed and approved by Guam Land Use Commission in 2008 for the use of portions of these non-DoD properties. This plan was approved by the Governor in 2009. Utilization of the properties by DoD for a live-fire training range complex would conflict with this plan. The area outside of the GLUP 77 parcel, former FAA parcel, and Harmon property includes densely populated communities. Operation of the range complex at those locations would require the SDZs to be placed over water.

AIRSPACE: A range complex at this location would violate FAA's prohibition on establishing a Restricted Area within 3 NM of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

OTHER CONSIDERATIONS: The off-shore areas of this part of the island are heavily used by locals and tourists for recreational purposes, and the SDZs projecting out over the adjacent waters would prohibit that use when ranges are in operation. In the initial scoping of the EIS, members of the Guam Legislature expressly requested the Navy avoid this alternative for a firing range.

A portion of the Former FAA parcel is considered recovery habitat for the Mariana fruit bat, Guam Micronesian kingfisher, Mariana crow, and Guam rail. The western portion of the GLUP property contains a large tract of undisturbed limestone forests as well.

**CONCLUSIONS:** Due to the impacts to the adjacent community, recreational resources, natural resources, airspace, and Government of Guam-proposed land use plans for the property, the west coast non-DoD option is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this site.

**Figure 18 – West Coast non-DoD properties**



### ***East Coast (non-DoD Properties – Route 15 [Alternative A])***

This site is one of two reasonable alternatives presented in the Final EIS and therefore merits additional analysis. Application of a smaller SDZ at this site has the potential to avoid impacts to Pagat Cave, Pagat Village and the existing trail. This location will be evaluated using the probabilistic methodology.

**Figure 19 – Route 15 Alternative A**





### ***East Coast (non-DoD Properties – Route 15 [Alternative B])***

This site is one of two reasonable alternatives presented in the Final EIS and therefore merits additional analysis. Application of a smaller SDZ at this site has the potential to avoid impacts to Pagat Cave, Pagat Village and the existing trail. This location will be evaluated using the probabilistic methodology

**Figure 20 – Route 15 Alternative B**



## ***East/West Coast Combination***

**SIZE:** This option would use a combination of the non-DoD East and West Coast options discussed previously as the West Coast Non-DoD Option (GLUP 77, Former FAA and Harmon properties) and the East Coast Non-DoD Option utilizing lands to the east of Route 15 to accommodate the live-fire training range complex requirements. The execution of this option would result in large SDZ areas encumbering off-shore areas on both sides of the island.

**LAND USE:** Land use would be the same as described for the Route 15 alternatives and the NCTS Finegayan alternative; however, this option precludes the ability to overlap SDZs and reduce the total footprint on Guam, as well as eliminates the ability to have training efficiencies through co-located ranges.

**AIRSPACE:** Placement of a live-fire training range complex at this location would have no impact to currently designated airspace on Guam unless portions of the range were located within the southern part of the Route 15 Alternative B footprint. A range complex at this location would violate FAA's prohibition on establishing a Restricted Area within 3 NM of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

**OTHER CONSIDERATIONS:** Other considerations, such as impacts to cultural and natural resources, recreational uses, and conflicts with existing land uses, would be the same as described for NCTS Finegayan. During the public scoping process for the Guam and CNMI Military Relocation EIS, GovGuam officials voiced their preference to have the live-fire training range complex located on the east coast of Guam thus avoiding the impacts to natural and recreational resources that exist in the area of the proposed west coast option.

**CONCLUSIONS:** Based on the extremely large footprint that would be required, the option of an East/West coast combination is not consideration a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this option.

## ***Inarajan Southeast Coast***

**SIZE:** This location is not a DoD-owned or controlled site and no specific acreage has been calculated. The notional site examined that is referred to as “Inarajan Southeast Coast” encompasses the land mass starting at the bay just south of Talafofo extending southward along the coastline for a distance of approximately 4 KM as shown in Figure 1.

**LAND USE:** This site is located on the southeast coast of Guam along Route 4 just north of the village of Inarajan. The range layout would require either the closure or difficult westward relocation of Route 4. Most of the community of Malojloj would need to be acquired and residents relocated; a severe land use constraint.

**AIRSPACE:** Placement of a live-fire range complex at this location would have no impact to currently designated airspace on Guam.

**OTHER CONSIDERATIONS:** The Inarajan Southeast Coast contains recovery habitat for the Guam rail. Furthermore, the coastal waters in this area are designated as Essential Fish Habitat (EFH).

**CONCLUSIONS:** Because of land use incompatibilities with surrounding communities, the Inarajan SE Coast is not considered a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable because it does not significantly change the impacts to this site or allow the avoidance of the population center. Therefore it is unnecessary to further evaluate this site.

**Figure 21 – Inarajan SE Coast**



## ***Agat Southwest Coast***

**SIZE:** This location is not a DoD-owned or controlled site and no specific acreage has been calculated. The notional site examined is referred to as “Agat Southwest Coast” and encompasses the land mass that is along the coast west of Route 2 starting at Facpi and extending southward to Cetti Bay as shown in Figure 1.

**LAND USE:** This site is located to the west of Route 2, north of Umatac and south of Agat. The challenges to this site include the presence of a significant number of residences, a solid waste transfer station, a radio station antenna site, the topography, adjacent recreational opportunities and tourism-related activities at Sella and Cetti Bays, and several waterways. A few residences are located on the northern portion of the site that would need to be acquired and demolished. The topography along this stretch of property varies from about 300 feet above sea level down to sea level. Several rivers are noted on the United States Geological Service (USGS) topographic map extending from the sea into or across the property. These include the Madofan River, Agoga River, Asmafines River, and the Sella River.

**AIRSPACE:** Placement of a live-fire range complex at this location would have no impact to currently designated airspace on Guam.

**OTHER CONSIDERATIONS:** Recovery habitat for the Guam rail is present along the west coast of Guam in the area of Agat, particular north of, and just south of Facpi Point. Small areas of recovery habitat for the Mariana fruit bat and the Guam Micronesian kingfisher exist in coastal inlets and tributaries south of Facpi Point.

**CONCLUSIONS:** Based on the significant number of residences and other incompatible land uses (solid waste transfer station, radio station antenna site), the topography, and adjacent recreational opportunities at Sella and Cetti Bays, the site is not considered a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this option.

**Figure 22 – Agat SW Coast**



## **Pago Bay**

**SIZE:** This location is not a DoD-owned or controlled site and no specific acreage has been calculated. The notional site examined that is referred to as “Pago Bay” encompasses the land mass that surrounds the Pago Bay water mass as shown in Figure 1.

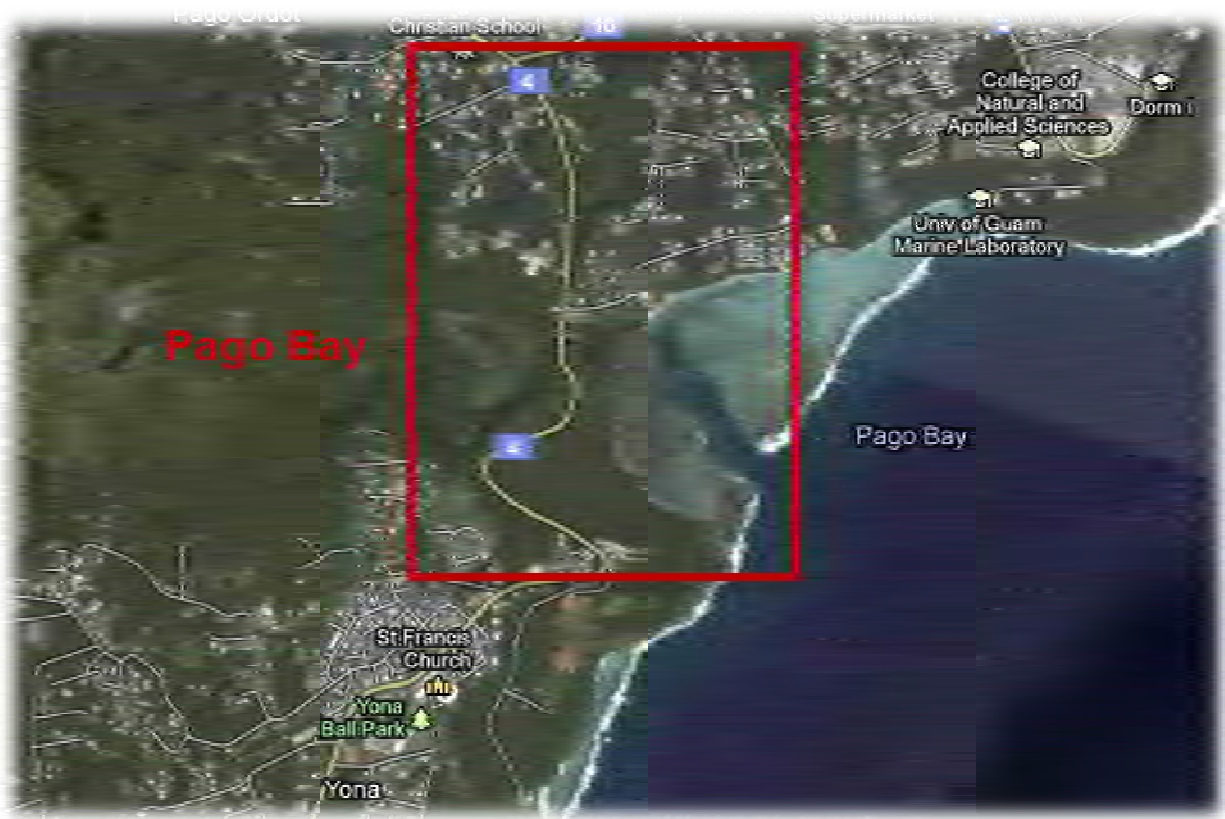
**LAND USE:** Any live-fire range complex at this site would be situated in a manner that straddles the existing Route 4 corridor and oriented to shoot offshore. Similar to Route 15 alternatives, the SDZs would reach out over the offshore waters. A range complex at this location would require the re-routing of Route 4 to the west of the proposed range complex. The range development would impact a large number of residences and businesses. Furthermore, Pago Bay is a popular and accessible recreational area that would be rendered unusable by citizens and tourists.

**AIRSPACE:** A range complex at this location would violate FAA's prohibition on establishing a Restricted Area within 3 NM of a civilian use airfield. The inability to establish a Restricted Area would impact training throughput and continuity.

**OTHER CONSIDERATIONS:** Recovery habitat for the Guam rail is present in the Pago Bay area, mostly west of Route 4. A new large residential development is under construction immediately south of Pago River. The University of Guam and nearby residences are sensitive to noise. Immediate and long term encroachment issues are also a considerable constraint.

**CONCLUSIONS:** Because of airspace and land use conflicts, the Pago Bay option is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this option.

**Figure 23 – Pago Bay**





## **Piti West Coast**

**SIZE:** This location is not a DoD-owned or controlled site and no specific acreage has been calculated. The notional site examined that is referred to as “Piti West Coast” encompasses a large portion of the land mass that is surrounded by Route 6 and Route 1 extending northward from Piti through Asan as shown in Figure 1.

**LAND USE:** The Piti West Coast site is located to the east of Route 1 directly on top of the Piti and Asan communities. This option would orient the ranges to the north extending over the near shore and offshore waters. The notional laydown would impact the routing of Route 1, a significant number of residences, a tourism facility, recreational opportunities and historic sites such as the War In The Pacific National Historic Park Asan Unit.

**AIRSPACE:** Placement of a live-fire range complex at this location would have no impact to currently designated airspace on Guam.

**OTHER CONSIDERATIONS:** This option would require the closure of a portion of Route 1, the major traffic artery of Guam.

**CONCLUSIONS:** Because of land use conflicts, Piti West Coast is not considered to be a reasonable alternative. The application of a smaller SDZ does not make this alternative potentially reasonable. Therefore it is unnecessary to further evaluate this option.

**Figure 24 – Piti West Coast**



## CONCLUSIONS AND WAY AHEAD

It is recommended that one site, NAVMAG, be further evaluated using the probabilistic methodology to determine whether the site is a potentially reasonable alternative for construction of a live-fire training range complex.

Based on the results of that analysis, a decision will be made to either prepare a Supplemental Information Report to assess whether this new information affects the previous resource impact conclusions noted in the Final EIS, or whether a Supplemental EIS is necessary to evaluate additional reasonable alternatives. This information will be provided to the Navy's decision-maker to ensure that an opportunity to consider all information is given prior to the rendering of a ROD for the live-fire training ranges on Guam.

**Addendum:** The probabilistic methodology was applied to the NAVMAG. This, along with previous modeling of the Rt. 15 alternatives, resulted in the identification of five live-fire training range complex alternatives which will be analyzed in a Supplemental Environmental Impact Statement (SEIS). The alternatives include Route 15 Adjusted Option A, Route 15 Adjusted Option B, and three sites within and immediately adjacent to NAVMAG. The Notice of Intent announcing the SEIS was published in the Federal Register on February 10, 2012 ChST.

## **Appendix F**

### **Resource Section Supporting Documents**

Appendix F.1: Geological and Soil Resources

Appendix F.2: Water Resources

Appendix F.3: Air Quality

Appendix F.4: Noise

Appendix F.5: Biological Resources

Appendix F.6: Ground Transportation

Appendix F.7: Hazardous Materials and Waste

## **Appendix F.1**

### **Geological and Soil Resources**

1. Impervious Surface Cover Calculations and Illustrating Figures.....	F.1-1
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## Impervious Surface Cover Calculations and Illustrating Figures

Table F.1-1 provides the calculated area of impervious surface cover associated with the Hand Grenade Range (Figure F.1-1) and each of the five range alternatives (Figures F.1-2 through F.1-6).

**Table F.1-1. Impervious Surface Cover Calculations by Alternative**

<i>Alternative</i>	<i>Acres</i>	<i>Hectares</i>	<i>Figure</i>
Hand Grenade Range (All Alternatives)	0.9	0.4	F.1-1
Alternative 1 (Route 15)	29.9	12.1	F.1-2
Alternative 2 (NAVMAG East/West)	29.0	11.7	F.1-3
Alternative 3 (NAVMAG North/South)	20.1	8.1	F.1-4
Alternative 4 (NAVMAG L-Shaped)	32.4	13.1	F.1-5
Alternative 5 (NWF, AAFB)	28.7	11.6	F.1-6



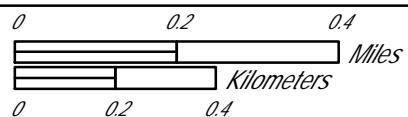
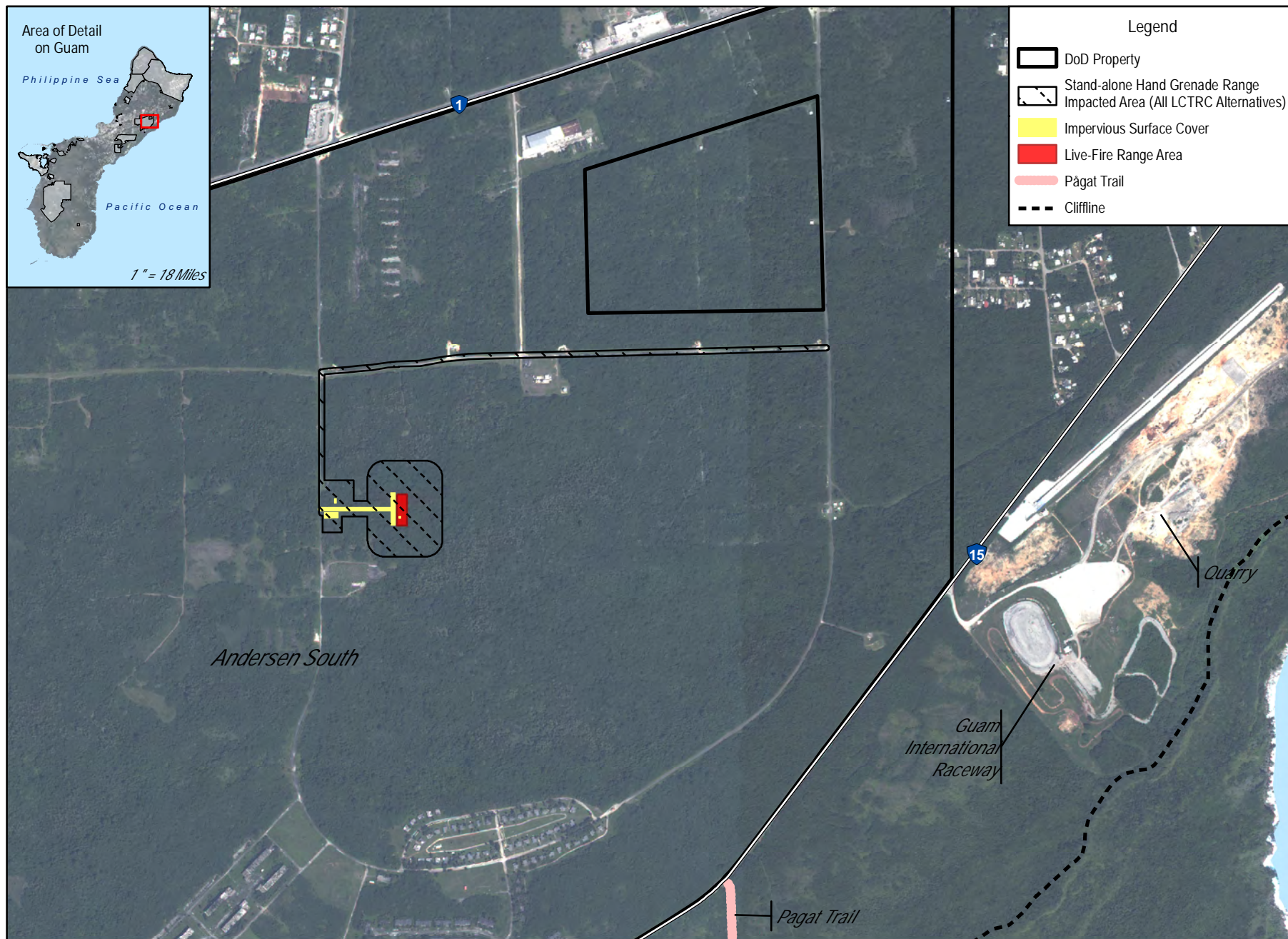
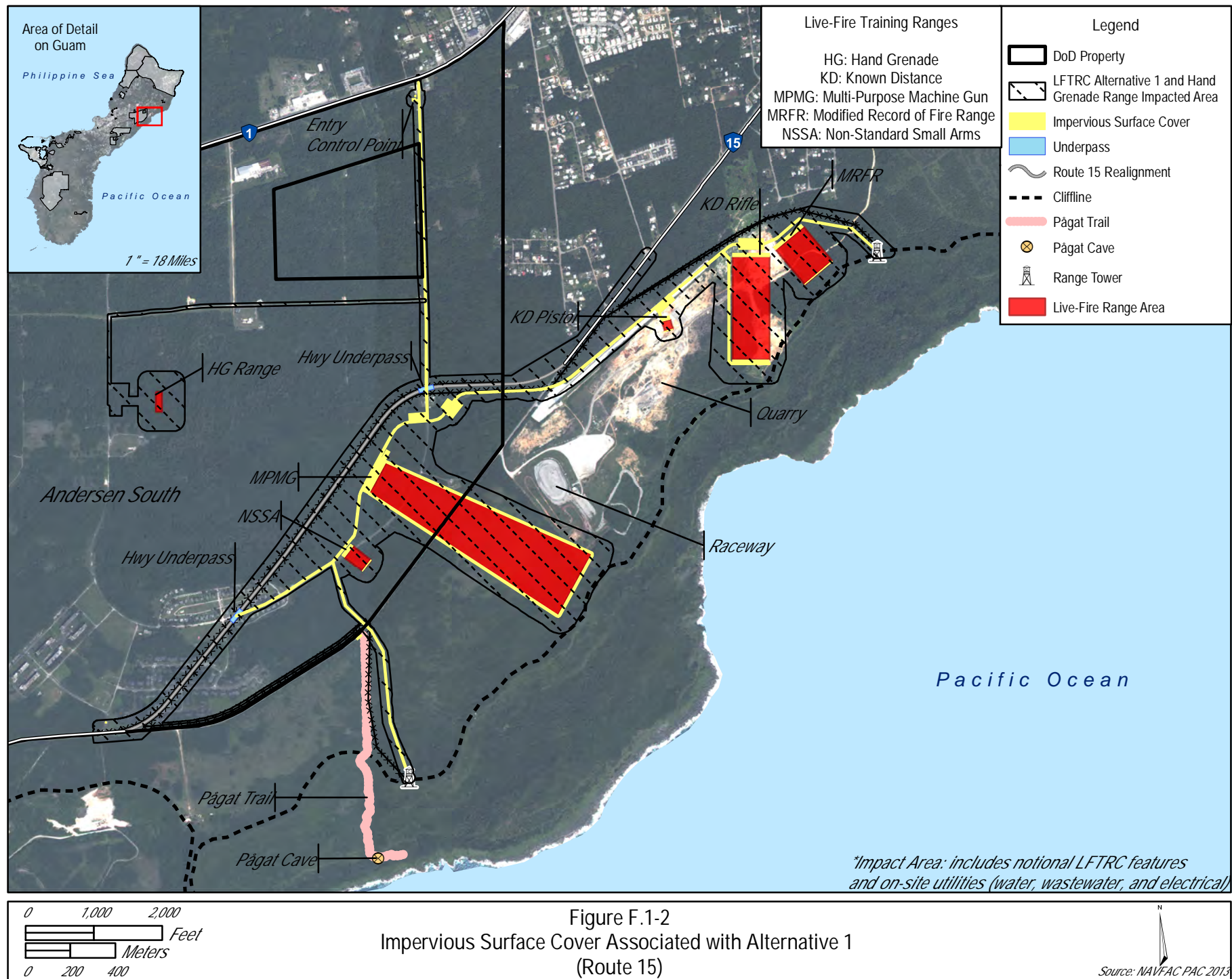


Figure F.1-1  
Impervious Surface Cover Associated with Hand Grenade Range  
(All Alternatives)

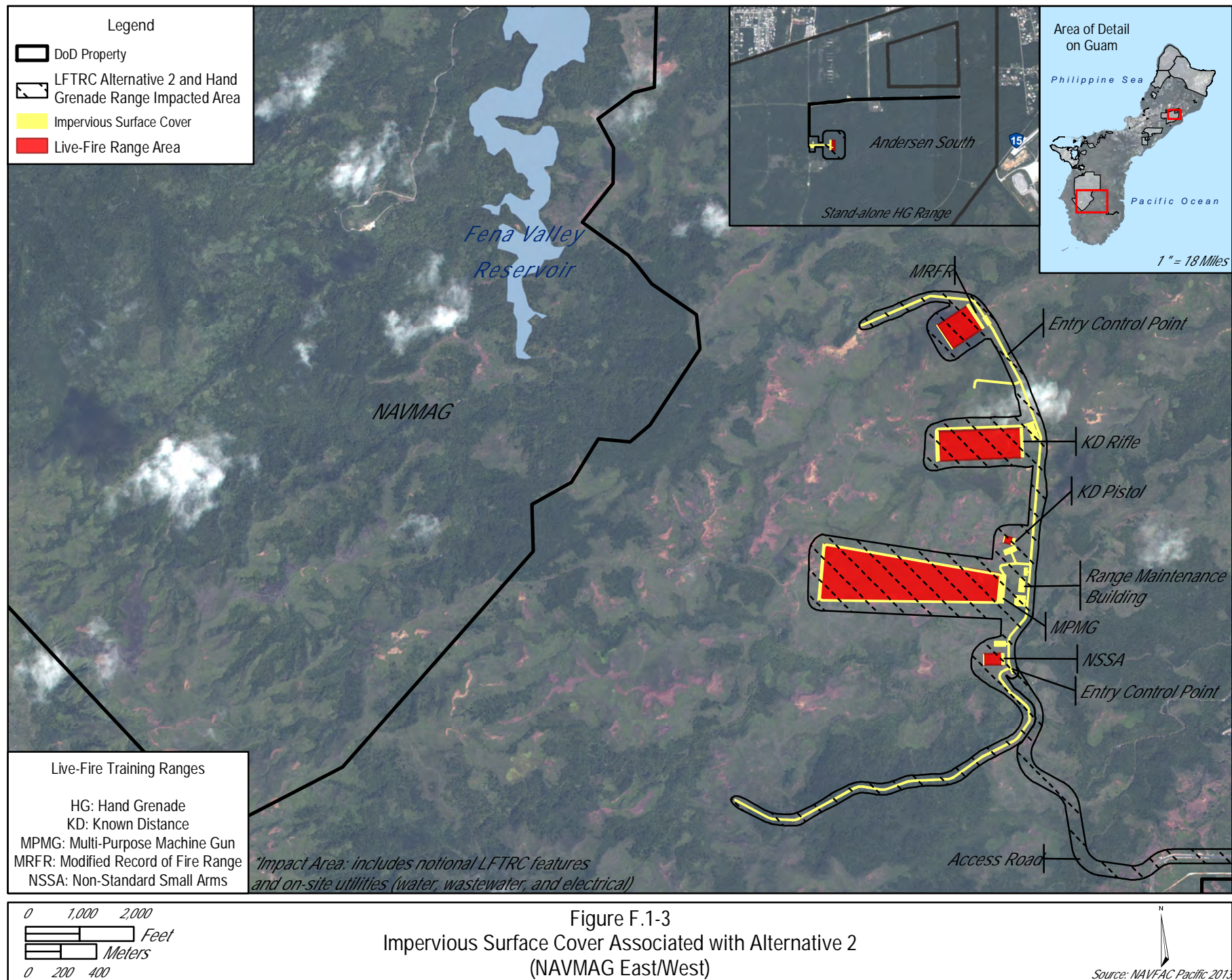
F.1-2

Source: NAVFAC Pacific 2013

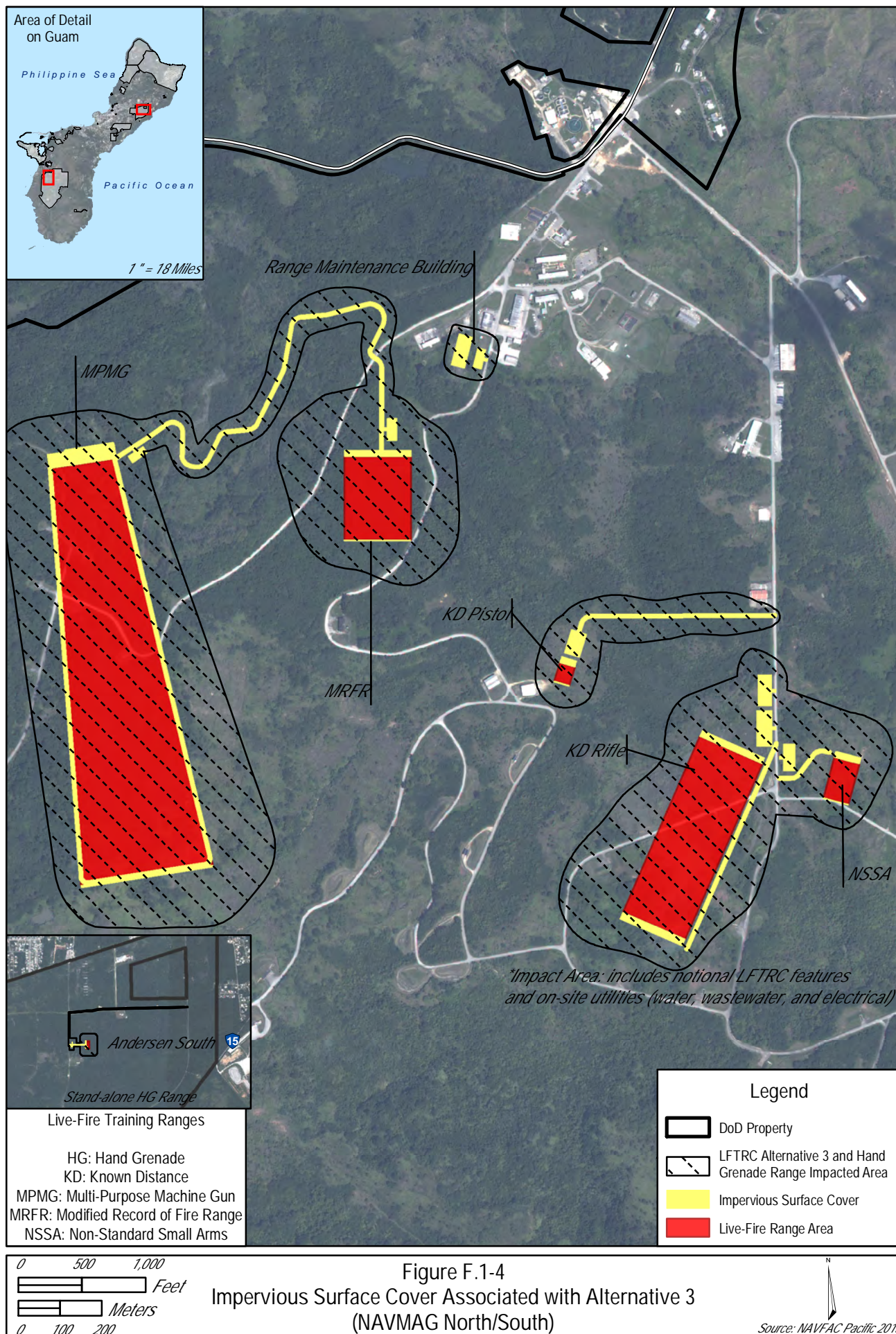




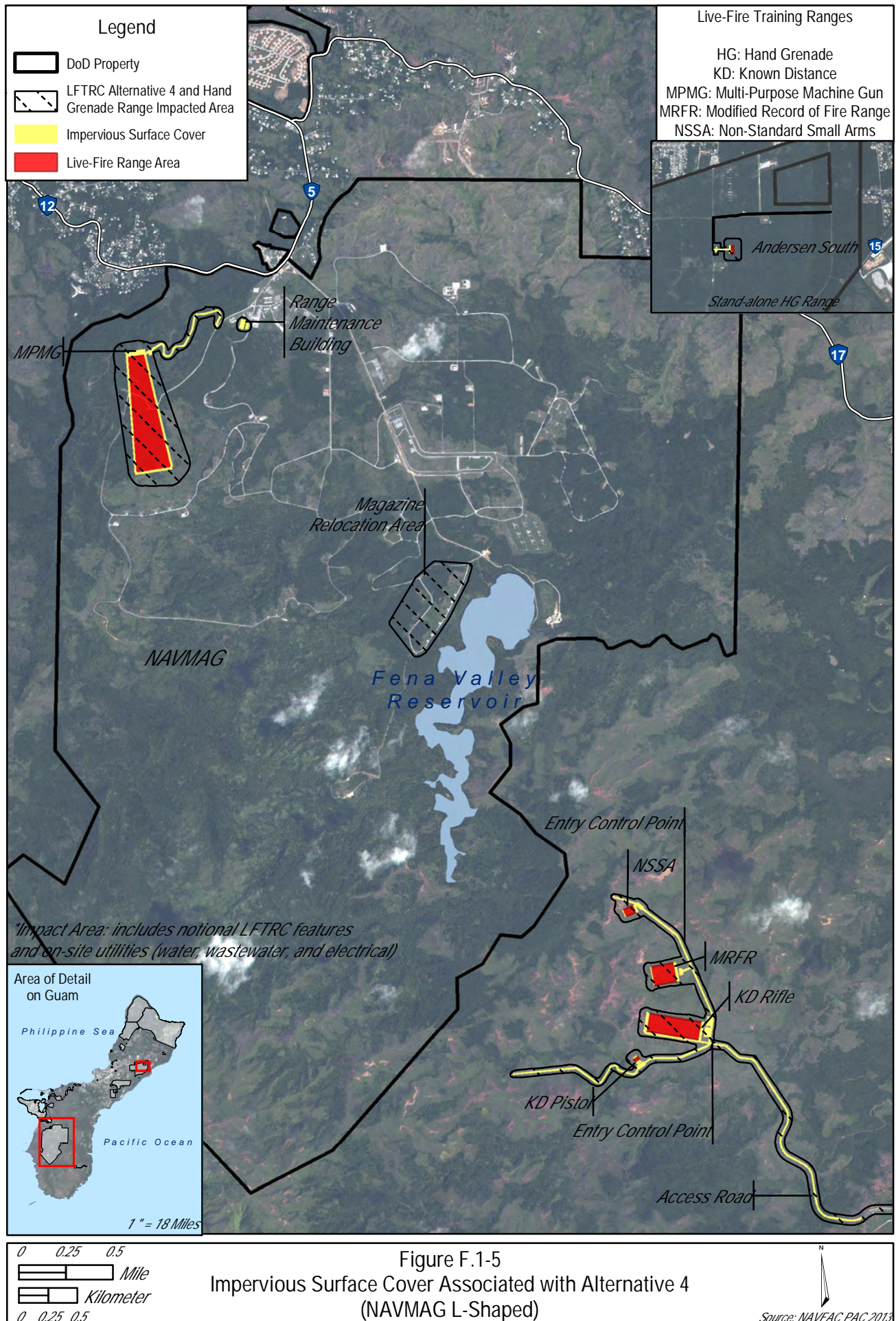




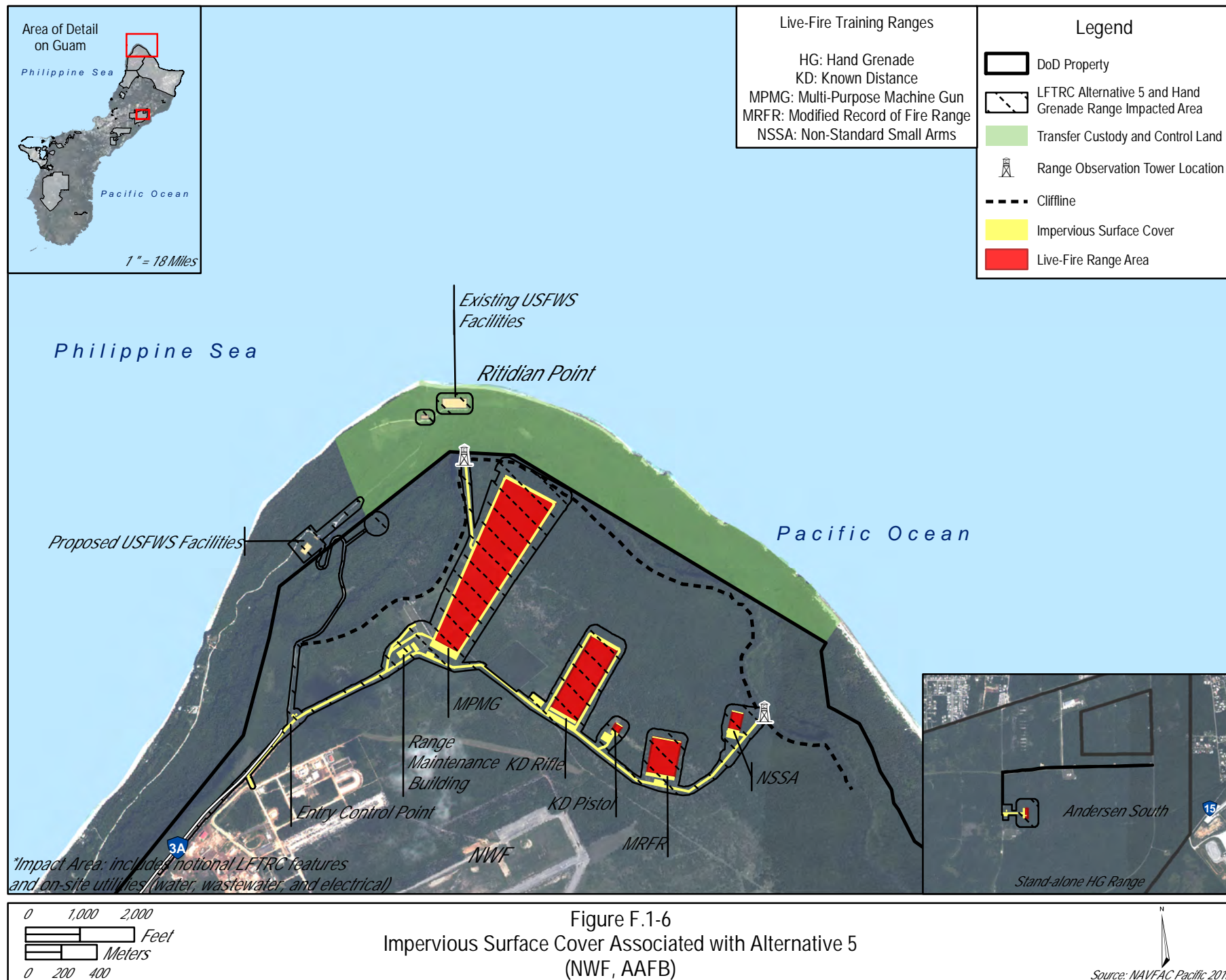












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